DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES
Waste Management Division
Solid Waste Program
406/444-1430
FAX # (406) 444-1499
STATE OF MONTANA
OFFICE LOCATION: 2209 PHOENIX AVE. HELENA, MONTANA
MAILING ADDRESS: PO BOX 200901 HELENA, MT 59620-0901

December 23, 1994

Gary Keeler
Landfill Manager
Butte-Silver Bow County
Courthouse
Butte, MT 59701

Dear Gary:

The Department has received the assessment monitoring test results (Table 2) from the Old Butte Landfill. The cover letter from Pioneer Technical Services indicates that the last of the organic data was received on December 1, 1994. The Department will use that date for the start of the next required sequence of events even though knowledge of the exceedance of the ground water protection standard for thallium was known earlier to Pioneer. They were apparently not knowledgable of the requirements of ARM 16.14.708(4) which requires Department notification within 14 days of the discovery.

The detection of Table 2 constituents above the ground water protection standard triggers a series of events with specific deadlines. The first requirement is stated in ARM 16.14.708(1)(a)(iv):

> For any constituent detected in the downgradient wells as a result of the complete Table 2 analysis, collect and analyze a minimum of four independent samples from each well (downgradient and upgradient) to establish background for the constituents detected;

The landfill must continue assessment monitoring as specified in ARM 16.14.708(1)(a)(v). During continued assessment monitoring the owner or operator must:

(A) Sample all wells for all Table 2 constituents at least annually;

(B) Sample all wells within 90 days and at least semi-annually thereafter for all Table 1 constituents and all Table 2 constituents detected in the initial, or subsequent annual, Table 2 sampling; and

(C) Collect and analyze at least one sample from each well (background and downgradient) during each sampling event.

(D) For any constituent detected in the downgradient wells as a result of the Table 2 analysis, collect and analyze a minimum of

four independent samples from each well (downgradient and upgradient) to establish background for the constituents detected;

Based on recent correspondence with the EPA, the initial Table 2 sampling and the previous Table 1 sampling can be used to count toward the four required samples. Thus if an analyte was detected in both events, only two re-samples for that analyte are needed. If a substance was only on the Table 2 list, then three samples are needed. The EPA suggests that to maintain independence of the samples, 30 days should elapse between sampling events. The landfill should thus sample the wells around the first of January and the first of February for the Table 2 detects and the first of March for the Table 2 detects and Table 1 constituents, as required by (B) above.

While this sampling is going on, ARM 16.14.708(4) specifies that a landfill which has exceeded a ground water protection standard:

> "(a)(i) Must characterize the nature and extent of the release by installing additional monitoring wells as necessary;
> (ii) Must install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well for all Table 2 constituents;
> (iii) Must notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells; and
> (iv) Must initiate an assessment of corrective measures within 90 days;".

In order to do an assessment of corrective measures, it is necessary to determine the extent of the problem. Please contact the Department promptly so that we can come to an understanding on the number of additional monitoring wells that may be required at this facility. The Department may be able to provide some additional technical assistance on the ground water flow in the area based on information developed for Superfund sites in Butte.

ARM 16.14.708(6)(a) requires:

> Within 90 days of finding that any of the constituents listed in Table 2 (ARM 16.14.706) have been detected at a statistically significant level exceeding the ground water protection standards defined under (5) of this rule, the owner or operator must initiate an assessment of corrective measures. Such an assessment must be completed within a reasonable period of time, not to exceed an additional 60 days, and be submitted to the department.

The corrective measures assessment must be initiated by March 1, 1995 and completed by April 30, 1995.

I would like to refer you to the requirements of ARM 16.14.708(6) which discusses the assessment of corrective measures, including the need to hold a public hearing prior to selection of remedy; ARM 16.14.708(7), which discusses remedy requirements; and ARM 16.14.708(8), which discusses implementation of the remedy, interim protection measures, and completion schedules; rather than quote the entire sections of the rules.

You should be aware that discussions are currently underway to decide whether the remediation of the Old Butte Landfill and the Clark Tailings should be handled under federal Superfund (CERCLA) or this program. That both the Clark Tailings and Old Butte Landfill should be remediated as "one facility" is not in dispute and in fact has been requested by officials representing Butte-Silver Bow and the Atlantic Richfield Company (ARCO). Which program assumes final authority for corrective action does not set aside current requirements for the assessment of corrective measures at the landfill. Regardless of which program assumes remediation authority, all future corrective action should be broadened to include and take into consideration the entire facility (i.e., Old Butte Landfill and Clark Tailings).

We realize the time deadlines are short; however, we will work with you to assure compliance in a timely fashion. If you have any further questions on this matter, please contact me.

Sincerely,

F. Patrick Crowley

F. Patrick Crowley
Solid Waste Regulatory Lead

cc: Jimmy Johnson, DPW, Butte-Silver Bow

File:Old Butte landfill\ground water
Path:H:\cb5403\wp\landfill\groundwater\butte\ACM.NOT

Silver Bow

ROUTE SLIP

DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES

TO: Proof JH

DATE: 4/20/94

1. Pat C FPC
2. Jon D JD
3.

- [x] Approval
- [ ] Comment
- [ ] Necessary Action
- [ ] Note and Return
- [ ] Note and File
- [ ] Investigate
- [ ] Prepare reply
- [ ] Signature
- [ ] See Me
- [ ] As requested
- [ ] For your information
- [ ] Per Conversation

REMARKS:

Sw/silvbuto. F93

mailed 4-22-94 ln

FROM: P3

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES
Solid and Hazardous Waste Bureau
Solid Waste Program
MARC RACICOT, GOVERNOR 406/444-1430
FAX # (406) 444-1499
STATE OF MONTANA
OFFICE LOCATION 836 Front Street Helena, Montana
MAILING ADDRESS: Cogswell Building Helena, MT 59620

April 21, 1994

Gary Keeler
Department of Public Works
Courthouse
Butte, Montana 59701

RE: **BUTTE-SILVER BOW CLASS II LANDFILL, SILVER BOW COUNTY - LICENSE NO. 20**
RESPONSE TO THE FALL 1993/WINTER 1994 GROUND WATER MONITORING AND SAMPLING EVENT

Dear Mr. Keeler:

The analytical results from the most recent ground water sampling event conducted in February 1994 at the old Butte-Silver Bow Class II Landfill were received by the Department on March 29, 1993. Upon review of these results it is clear that established enforcement standards/ground water protection standards (GWPSs)/maximum contaminant levels (MCLs) have been consistently exceeded monitoring well BSB-A2 for tetrachloroethene and trichloroethene (sampling events - March 1993, and February 1994). Other volatile organic compounds (VOCs), as well as several metals have also been detected in the ground water monitoring at this site.

According to the Administrative Rules of Montana (ARM) 16.14.708(1)(a),

> "If ground water concentration(s) in samples from any facility ground water monitoring well(s) for any Table 1 (ARM 16.14.706) constituent **equal or exceed an enforcement standard** or show a significant statistical increase above background levels or a statistically significant decrease in pH occurs, the owner or operator must:
>
> ARM 16.14.708(1)(a)(ii) Begin a program of **Assessment Monitoring** and re-sample all of the ground water monitoring wells for constituents of Table 2 (ARM 16.14.706) within 90 days;"

NOTE: "90 days" in this citation refers to 90 days from the date of the discovery of the attainment or exceedence of the enforcement standard/GWPS/MCL. The date of discovery is defined as the date on which the analytical results were received by the owner/operator, and/or the technical representative. Therefore, from the report date indicated on the metals analytical data sheets of March 10, 1994 (VOC analysis lab date is March 3, 1994), the 90-day deadline to re-sample all of the monitoring wells for the Table 2 list of parameters/constituents would be **June 9, 1994**.

Following the Department's telephone inquiry on April 5, 1994 to Pioneer Technical Services, Inc. concerning several sampling issues, Mr. David Tuesday of Pioneer responded in a letter dated April 5, 1994 to the Department. A copy of the chain-of-custody for the metals samples was submitted with the letter, as requested by the Department over the phone, and a brief summary of the analytical results for the February 1994 sampling event was also included. The analytical summary did address the issue raised by the Department concerning the contaminants detected in the VOC Trip/Field Blank.

The Department is unfamiliar with the contaminant constituents of 1,2-dichloroethane and chloromethane possibly being introduced from a laboratory source, or from a preservative as suggested. 1,2-dichloroethane is used as a solvent, a lead scavenger in gasoline, and is produced as a chemical intermediate . Ground water contamination impacted by landfill leachate over time may exhibit detectable levels of 1,2-dichloroethane from degradation of other chlorinated chemical compounds such as tetrachloroethene and trichloroethene. Chloromethane or methyl chloride is a poisonous VOC. It is used as a refrigerant, and therapeutically as a local anesthetic. No analytical laboratory usages with these 2 VOCs are clear at this time.

If you have any questions concerning Assessment Monitoring and/or you wish to discuss the longer-range ramifications that Assessment Monitoring and eventually Corrective Measures may entail, please don't hesitate to give me a call. It may be helpful in the near future to have an informal meeting to discuss the site-specific application of the ground water monitoring, and possibly other State regulations that may be pertinent to this closed Solid Waste facility.

Sincerely,

Pat Potts by lh

Pat Potts
Environmental Specialist

cc: Jim Johnston, Director of Public Works, Department of Public Works, Courthouse, Butte, MT 59701
Butte-Silver Bow County Commissioners, 155 West Granite Street, Butte, MT 59701
Dan Powers, R.S., Butte-Silver Bow County Sanitarian, 25 West Front Street, Butte, MT 59701
Marcus Murphy, and David S. Tuesday, Pioneer Technical Services, Inc., P.O. Box 3445, Butte, MT 59702

path: sw\silvbuto.f93

file: Silver Bow Co./old Butte-Silver Bow Class II/grd wtr (corr)

Silver Bow

ROUTE SLIP

DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES

TO: Proof

DATE: 2/2/94

1. Pat C.
2. Jon D JD
3. Roger RCS

- [x] Approval
- [ ] Comment
- [ ] Necessary Action
- [ ] Note and Return
- [ ] Note and File
- [ ] Investigate
- [ ] Prepare reply
- [ ] Signature
- [ ] See Me
- [ ] As requested
- [ ] For your information
- [ ] Per Conversation

REMARKS:

sw/silbut.app

FROM: P 3

mailed 2-3-94 lh

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES
Solid and Hazardous Waste Bureau
Solid Waste Program
MARC RACICOT, GOVERNOR 406/444-1430
FAX # (406) 444-1499
STATE OF MONTANA
OFFICE LOCATION 836 Front Street Helena, Montana
MAILING ADDRESS: PO BOX 200901 Helena, MT 59620-0901

February 2, 1994

David S. Tuesday, Principal Hydrogeologist/Geochemist
Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

RE: **BUTTE-SILVER BOW CLASS II LANDFILL, SILVER BOW COUNTY - LICENSE NO. 20**
APPROVAL FOR FALL 1993 GROUND WATER SAMPLING EVENT.

Dear Mr. Tuesday:

Thank you for the timely, concise response to my letter dated January 28, 1994 concerning questions, comments, and concerns I had about the Standard Operating Procedures (SOPs) submitted to the Department in conjunction with the proposed Fall 1993 ground water sampling event to be conducted at the Old Butte-Silver Bow Class II Landfill. The Department approves Pioneer's SOPs which were submitted with a cover letter dated January 18, 1994, along with the additional letter of responses dated January 31, 1994.

Please consider including dichlorodifluoromethane to the list of required volatile organic compounds in the Administrative Rules of Montana (ARM) 16.14.706 Table 1.

Sincerely,

Pat Potts
Environmental Specialist

cc: Jim Johnston, Director of Public Works, Department of Public Works, Courthouse, Butte, MT 59701
Gary Keeler, Department of Public Works (As above)
Butte-Silver Bow County Commissioners, 155 West Granite Street, Butte, MT 59701
Dan Powers, R.S., 25 West Front Street, Butte, MT 59701

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Silver Bow

ROUTE SLIP

DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES

TO: Proof ph#

DATE: 1/27/94

1. Pat C. PC
2. Jon D. JD
3. Roger T. RT

☑ Approval	☐ Comment	☐ Necessary Action
☐ Note and Return	☐ Note and File	☐ Investigate
☐ Prepare reply	☐ Signature	☐ See Me
☐ As requested	☐ For your information	☐ Per Conversation

REMARKS:

route quickly please

Sw/ silbutt. old

mailed 1-28-94 lm

CC: "blind" to
Dave Erickson
SRM
P.O. Box 4168
Butte, MT 59702

FROM: p3

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES
Solid and Hazardous Waste Bureau
Solid Waste Program
MARC RACICOT, GOVERNOR 406/444-1430
FAX # (406) 444-1499
STATE OF MONTANA
OFFICE LOCATION 836 Front Street Helena, Montana
MAILING ADDRESS: PO BOX 200901 Helena, MT 59620-0901

January 28, 1994

David S. Tuesday, Principal Hydrogeologist/Geochemist
Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

RE: **BUTTE-SILVER BOW CLASS II LANDFILL, SILVER BOW COUNTY - LICENSE NO. 20**
REQUIRED FALL 1993 GROUND WATER SAMPLING EVENT - REVIEW AND COMMENTS ON STANDARD OPERATING PROCEDURES SUBMITTED.

Dear Mr. Tuesday:

Thank you for providing Pioneer's Standard Operating Procedures (SOPs) for ground water sampling. There are still several outstanding items that will need to be clarified/verified in writing concerning this site-specific sampling event. These items are:

1. List the background well(s) that you plan to sample at this facility and why you have chosen the particular well(s).

2. Determine the appropriate Table of parameters/constituents for which you will have the samples analyzed (i.e. Table I for an additional Detection Monitoring analysis, or Table II for the Assessment Monitoring based on only one set of Table I analytical results to date).

3. List and describe the sample blanks that you will be preparing for analysis. At a minimum (assuming you are using a bailer that will be decontaminated between wells both for purging and for sampling, as PTS-SOP-GW-10 implies) the sample blanks should include the following:

* A Trip Blank - for volatile organic compounds (VOCs), prepared from de-ionized water from the laboratory. The purpose of the trip blank is to accompany the sample containers which includes, shipment of the containers to the site, on-site sampling, as well as in transport back to the laboratory for analysis. If the laboratory is agreeable to holding this sample until results from the sampling event can be determined and the trip blank sample holding time has not been exceeded, the analysis of this sample blank may be deferred, and may even be omitted if no VOC anomalies are detected in the other samples and sample blanks.

* An Equipment Blank - should consist of a full sampling suite. The equipment blank consists of the rinsate water from decontamination of the sampling equipment between wells (i.e. in this case, the sampling bailer).

* A Duplicate Sample (complete suite of samples) from one of the down gradient monitoring wells.

4. From the existing ground water monitoring wells at this facility, please provide a list of the wells that you will be sampling. Include the background well(s) in this list, and prepare the list in the order in which the wells will be sampled in the field.

Specific comments concerning Pioneer's SOPs that were submitted to the Department for this sampling event at the old Butte/Silver Bow Class II Landfill, are as follows:

A. PTS-SOP-DE-01

#1. There is no "Site Safety Plan" at this facility yet. It will be required in the final site specific Sampling and Analysis Plan (SAP), once it has been adequately determined that the ground water is contaminated at this site [see Administrative Rules of Montana (ARM) 16.14.706(1)(c)].

B. PTS-SOP-DE-02

All equipment <u>entering</u> the site must be properly decontaminated before being brought onto this site. This issue is more explicitly addressed in PTS-SOP-GW-11.

C. PTS-SOP-FM-01

Please consider doing a headspace vapor analysis of the wells using an explosimeter, or a similar meter to measure the lower-explosive-limit (LEL) and/or percent by volume of explosive gases. This would be helpful in detecting and delineating methane gas generated in the landfill area. Note: this comment may be equally applicable to **PTS-SOP-GW-11**.

D. PTS-SOP-S-01 and PTS-SOP-S-02

No soil sampling will be required during the ground water monitoring sampling event. Why were these SOPs included?

E. PTS-SOP-GW-05

Please check well completion forms. I feel confident that these wells have been surveyed into a USGS benchmark elevation.

NOTE: Well completion forms are quite helpful when sampling ground water monitoring wells for the first time.

F. PTS-SOP-GW-10

#9. Please acknowledge that 40-ml. VOAs will be checked for air bubbles after filling.

Will individual disposable bailers be used for sampling, and/or possibly even for purging at each well? This would reduce the need for a full sample suite equipment blank, as distilled water from decontamination rinsate water would only need to be analyzed for VOCs.

G. PTS-SOP-GW-12

Page B-18. Although ground water monitoring wells have already been installed for this sampling event, and this SOP should not be necessary, it is important to comment on Pioneer's need for a "vent hole" in the casing. If this "vent hole" is actually in the well casing, it will not be an approved completion practice. The opportunity for contaminants to enter this hole and possibly alter the natural quality of the ground water at that location is of too great a concern to permit such a hole. If I have misunderstood the intent and location of this hole, and you plan to have a small hole near the top of the protective outer steel casing, the Department has no serious concern about that. Please let me know where this intended "vent hole" would be placed, in the event that Pioneer should do any ground water monitoring well constructions in the future which would involve the Solid Waste Program.

Be sure to notify the Department at least several days prior to conducting the ground water sampling event, so that the Department may be present on-site to observe sampling procedure and collect split-samples, as necessary [ARM 16.14.706(a)(iv)(G)].

The Department will require a brief written response concerning all of the above items, so that approval can be given and the Fall 1993 ground water sampling event conducted as soon as possible.

Sincerely,

Pat Potts

Pat Potts
Environmental Specialist

cc: Jim Johnston, Director of Public Works, Department of Public Works, Courthouse, Butte, MT 59701

Gary Keeler, Department of Public Works, (as above)

Butte-Silver Bow County Commissioners, 155 West Granite Street, Butte, MT 59701

Dan Powers R.S., Butte-Silver Bow County Sanitarians, 25 West Front Street, Butte, MT 59701

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DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES

STAN STEPHENS, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

FAX # (406) 444-2606

HELENA, MONTANA 59620

Solid & Hazardous Waste Bureau
Telephone: (406)444-2821

March 15, 1990

Butte Landfill
Butte-Silver Bow Health Dept.
58 West Quartz
Butte, MT 59701

Dear Landfill Operator:

I have enclosed a copy of the "Montana Solid Waste Management Act", Section 75-10-201 through 75-10-233 M.C.A. for your reference. You will note that the 1989 Montana Legislature passed certain amendments to the act regarding the **provision of groundwater monitoring systems at landfills.** I have highlighted Section 75-10-207, the section requiring groundwater monitoring at certain municipal solid waste landfills and **other disposal sites.**

Items number three and four of this section require owners and operators of certain landfills to submit site specific hydrogeological information to be prepared by each owner/operator. These sections also require a plan for installation of a groundwater monitoring system as necessary. This information is to be evaluated in order to make a decision whether a particular landfill must have a groundwater monitoring system or not, and when the system will have to be installed.

The act requires that this department develop specific rules for implementation of these requirements, and the department is in the process of developing these rules. You will note, however, that "high" priority landfill sites must have groundwater monitoring installed by January 1, 1991 and lower priority sites by January 1, 1992, so little time is available to accommodate a lengthy rulemaking process and still allow communities to fit these requirements into the annual budget process.

Some landfills already have some form of groundwater monitoring system in place, and these will be considered for adequacy to meet these requirements. It is estimated that only about nine landfills in Montana have systems which will be acceptable. We do not have all the information available for some sites, however, and there may be other systems which are satisfactory. Numerous owners and operators have taken the lead on this issue due to the passage of HB 486 and due to the impending EPA landfill regulations, and many are already well along in development of their hydrogeological report, department approval, installation of wells and groundwater sampling.

We request that each landfill owner/operator read Section 75-10-207 carefully to see if his/her landfill meets the population requirements. If your landfill is included in this requirement, we request that you begin to obtain the hydrogeological information necessary for us to make the determination whether monitoring is necessary and when the monitoring will be required. In most cases, you will find it economically advantageous to have your hydrogeological assessment and groundwater well installation completed under the same contract with the same consultant, and we would encourage you to proceed with development of a monitoring system immediately in order to gather as much information as you can about the impact of your landfill prior to the time when the new "Subtitle D" regulations are effective. We do request that plans for monitoring be submitted to this agency for review prior to installation, however, to insure that the system will meet our requirements.

You will also note that the section addresses "municipal solid waste landfills and **"other disposal sites that at any time accepted household waste."** Some facilities will fall under this requirement even though they may be accepting only "Group III" wastes such as tree limbs, brush or demolition waste. If owners or operators of these sites ever accepted household waste in the past and the sites were open as of October 1, 1989, they will still have to prepare the hydrogeological assessment. The department will endeavor to interpret the actual monitoring requirements based upon a reasonable waste history, however.

In general, most landfill owners/operators will need to secure the services of a qualified geologist, hydrogeologist or geo-technical engineer to prepare the assessment of their sites. We have copies of a consultant list in our office which includes the majority of consulting firms who do business of this kind in Montana, and I would be happy to make this available to you upon request.

If you have any questions, or if I may be of additional service, please contact me.

Sincerely,

James E. Leiter, R.S.
Solid Waste Program Manager

sw\fmltr\hb486.not

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

TED SCHWINDEN, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

HELENA, MONTANA 59620

April 19, 1984

Don McLean, R.S.
Butte-Silver Bow County
Health Department
58 West Quartz
Butte, MT 59701

Dear Don,

Our office has reached a decision on your department's December 1, 1983 request to allow the disposal of septic tank pumpings at the Butte-Silver Bow sanitary landfill.

As you are aware, we are concerned about the hydrology in the area of the Butte landfill. Past groundwater samples below the landfill and Clark Tailings have indicated the groundwater is being severely impacted. Whether this impact is soley from the tailings or a combination of the tailings and landfill leachate is not known at this time.

The Clark Tailings are being considered for remedial action under our Superfund program. Extensive groundwater monitoring of the tailings might be part of this action. If this occurrs, this monitoring would also shed some light on whether or not the landfill is also impacting the groundwater.

If a groundwater monitoring program for the Clark Tailings is not implemented or will not provide sufficient monitoring of the landfill, we will request the landfill to implement a separate groundwater monitoring program of its own.

Until more is known about the Clark Tailings project, we will allow the Butte-Silver Bow landfill to accept septic tank pumpings on an interim basis. These pumpings must be handled and disposed of in the manner proposed in the operation and maintenance plan you submitted with your December 1st request. In addition, we will also require the septic tank pumping disposal area to be located in the highest portions of the landfill, away from any previously completed refuse cells.

If you have any questions or if we may be of any assistance, please let us know.

Sincerely,

JOHN C. GEACH
Solid Waste Management Bureau
Telephone: (406) 444-2821

JCG:vc

"AN EQUAL OPPORTUNITY EMPLOYER"

CLOSED
BUTTE-SILVER BOW LANDFILL
LICENSE NUMBER 20

PIONEER TECHNICAL SERVICES

GROUNDWATER SAMPLING,
AUGUST/SEPTEMBER 1994

DECEMBER 1994

IS LOCATED IN THE GROUNDWATER
MONITORING REPORTS ARCHIVE,
BOX NUMBER 7

RECEIVED 12/13/1994

ARCO
307 East Park Street, S
Anaconda, Montana 59
Telephone 406 563 5211
Facsimile 406 563 8269

File
Do not send

Site/O.U. 4-03-05-05
DHES File # SBC-BA-PSOU
Admin. Record: Yes ____ No. ____
Administrative Record # ____
Confidential: Yes ____ No X
Key Words/Comments: ____

September 19, 1994

CERTIFIED-RETURN RECEIPT REQUESTED

Mr. Russ Forba
U.S. Environmental Protection Agency
Region VIII, Montana Office
Federal Building
301 S. Park, Drawer 10096
Helena, Montana 59626-0096

Mr. Joseph M. Santerella, Esq.
U.S. Environmental Protection Agency
Region VIII
Assistant Regional Counsel
One Denver Place
999 18th Street
Denver, Colorado 80202

Mr. James Scott
Montana Department of Health
and Environmental Sciences
Environmental Remediation Division
2209 Phoenix Avenue
Helena, Montana 59620-0901

Mr. James Madden, Esq.
Legal Division
Montana Department of Health
and Environmental Sciences
2209 Phoenix Avenue
Helena, Montana 59620

Re: Silver Bow Creek/Butte Area Superfund Site - Butte Priority Soils Operable Unit RI/FS - Docket No. CERCLA VIII-92-18.

Dear Gentlemen:

On behalf of the Butte Priority Soils PRP Group, attached please find the final responses to EPA and State of Montana comments regarding the Butte Priority Soils Operable Unit (BPSOU) Draft Historical Data Evaluation Report (HDER) and Draft Historical Data Summary Report (HDSR) (EPA Letter Ref. 8MO, July 21, 1994). The final comment responses are keyed to comment numbers provided in EPA's July 21, 1994 letter.

Technical representatives of the BPSOU PRP Group appreciate the opportunity to discuss the Group's draft responses with the Agencies during our meeting of August 24, 1994. During the meeting, both the PRP Group and the Agencies committed to undertaking certain activities geared toward resolving key project issues prior to development of the BPSOU RI/FS Work Plan. The PRP Group's understanding of these commitments is summarized below.

RECEIVED
SEP 20 1994
ARCOD-5010-B
Montana Department of Health
and Environmental Sciences
ERD,Superfund

File: Old Butte Ground water.

established in consultation with the Agencies and in consideration of the final volume of remaining tailings.

Site/O.U. 4-03-05-14
DHES File # SBC-BA-PSOU
Admin. Record: Yes ____ No. ____
Administrative Record # ____
Confidential: Yes ____ No X
Key Words/Comments: ____
Complete & original file at 4-03-05-0

RESPONSE TO STATE COMMENT 11, DRAFT HDER

Please see the Response to State Comment 13 on the draft HDER.

RESPONSE TO STATE COMMENT 12, DRAFT HDER

As for waste rock dumps, the PRPs believe that the extent of characterization of the Parrott Tailings should be based on the ultimate manner in which they are to be remediated. Previous remedial activities within the BPSOU have focused on in-place closure, and it is the PRPs' position that such practices should continue. In-place closure requires collection of information regarding slope and the physical and chemical nature of surficial soils. Extensive drilling is not required for in-place closure. The PRPs believe drilling may be necessary only if material is to be excavated and moved because drilling will provide information on material volume.

RESPONSE TO STATE COMMENT 13, DRAFT HDER

The PRPs believe that the most efficient means of closure for the old Butte-Silver Bow Landfill would be to conduct such closure 1) in accordance with applicable RCRA requirements, 2) outside the purview of the BPSOU RI/FS, and 3) in conjunction with final closure of the Clark Tailings. As discussed during the August 24, 1994 technical meeting, the PRP Group will submit a formal written request to the Agencies to proceed with closure of the old Butte-Silver Bow Landfill and Clark Tailings in this manner.

RESPONSE TO STATE COMMENT 14, DRAFT HDER

The Alice Mill/Waste Rock Dump site will receive the characterization necessary to ensure that its remediation is consistent with that of other waste rock dumps, as established through the RI/FS process.

RESPONSE TO STATE COMMENT 15, DRAFT HDER

The presence of mercury at the Centennial Mill site will be evaluated during the BPSOU RI. These activities will be described in the RI/FS Work Plan.

RESPONSE TO STATE COMMENT 16, DRAFT HDER

As noted in the response to EPA S/MWI Comment 20, the PRPs believe that the success of past reclamation efforts should be assessed based on the continued function of vegetated soil covers. Such success should be evaluated using percent cover, biomass production, and species diversity criteria, based on site-specific performance data from previously reclaimed sites and a reference site. Reclamation success should also include qualitative assessment of potential erosion of soil

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII, MONTANA OFFICE
FEDERAL BUILDING, 301 S. PARK, DRAWER 10096
HELENA, MONTANA 59626-0096

July 21, 1994

RECEIVED
JUL 25 1994
Montana Department of Health and Environmental Sciences
Solid and Hazardous Waste Bureau

Site/O.U. 4-03-05-05
DHES File # SBC-BA-PSOU
Admin. Record: Yes ____ No ____
Administrative Record # ____
Confidential: Yes ____ No X
Key Words/Comments: ____

Ref: 8MO

Mr. Dave Sinkbeil
ARCO
307 E. Park Street
Anaconda, MT 59711

Dear Dave:

Attached are the EPA and State comments concerning the Draft "Historical Data Evaluation Report (HDER)" for the Butte Priority Soils OU and including several comments on the PRP group's response to prior EPA and State comments on the Historical Data Summary Report (HDSR).

Please respond to these comments by September 19, 1994. We agree with the PRP group's assessment that it is unnecessary to resubmit the HDSR and HDER and that development of the Work Plan is the efficient mechanism for moving this project forward. However, resolution of the following comments should be completed before the work plan development begins.

We are hopeful that comments relating to the stormwater evaluation program will be resolved shortly so that this work can be concluded this year. As you are aware, we are planning to have a stormwater program meeting in Butte on August 2, 1994 in Butte. I will discuss this further with you prior to the meeting.

If you have any questions concerning these comments, please contact Sara Weinstock (406-782-7415), Jim Scott (406-444-0493), or myself(406-449-5720).

Sincerely,

Russ Forba

Russell W. Forba
Remedial Project Manager

cc: Joe Santarella, 8RC
Sara Weinstock, 8MO
James Scott, MDHES
Bob Rennick, CDM/FPC

Printed on Recycled Paper

7) Page 3-9 and page 5-4 state, "...13 sites are either located outside the BPSOU boundaries...." The State request that these 13 sites be listed and reason for exclusion. If the Orphan Girl Dump (#108) is in this list (page 3-16 states that it is), then this site should be included in the BPSOU RI/FS. The Ryan-Goldsmith (#13) requires further investigation for possible inclusion in the BPSOU RI/FS. Complete DN#1 and DN#2 at a minimum.

8) Complete DN#1 and DN#2 for the "Montana Street & I-90" (#152) source area.

9) Complete DN#1 and DN#2 for the "Bonanza Dump" (#120) source area.

10) Page 3-24, under "Tailings Accumulations," second paragraph, first sentence: The statement is made that further characterization of the Colorado Tailings is unnecessary because it is currently being relocated. Only a portion of the tailings are being removed. The remaining tailings and their impact on groundwater quality need to be evaluated and included in the RI.

11) Complete DN#1 and DN#2 for the Clark Tailings (#155). As groundwater investigations are required (see State Comment #22) conduct these investigations during that work. The State does not believe that reviewing "available records" can elucidate chemical/physical characteristics.

12) Complete DN#1 and DN#2 for the Parrott Tailings (NA). The State does not believe that reviewing "available records" can elucidate chemical/physical characteristics. Further, the State believes boring on a grid using 150' centers will be adequate to complete DN#2. The grid would follow the Metro Storm Drain and stretch between Harrison Ave. and Continental Dr. The State has looked at this task and find it will require about 100 borings to complete. From past investigations in the area, 50' depths should be adequate to define the extent of tailings. Further, some of the borings should be completed as monitoring wells (see States comment #21 on the groundwater model for the BPSOU RI/FS).

13) The "old" Butte-Silver Bow Landfill should be included as part of the BPSOU RI/FS. The landfill used Clark tailings as cover material in its day to day operation. APPENDIX C photodocuments tailings and the mixing of solid waste with tailings. {There are three photodocuments labeled PSOU-SC-HDER-C.1, PSOU-SC-HDER-C.2, and PSOU-SC-HDER-C.3.} Further, monitoring well logs and water quality results from these monitoring wells document the existence of the tailings and the migration of COC's off site (APPENDIX C). Thus the landfill should be included as a source area.

14) Page 3-33, the statement is made that the Alice Mill site is reclaimed. This "reclamation" declaration is limited only to "direct" human health exposure concerns. Further, the State believes parts of the "Alice Mill" facility are still buried beneath the Alice Dump. Regardless, the Moulton Mill is buried beneath the Alice Dump. The Alice Dump is not reclaimed, and much consideration needs to be give this site.

7) Page 2-9 and page 3-4 note, "...13 sites are either located outside the PESOU boundaries..." The State requires that these 13 sites be based on known and random for analysis. If the Orphan Oil Essay (#09) is in this list (page 3-16 states this is so), then it also should be included in the PESOU SITES. The Ryan Aluminum (#13) requires further investigation for possible inclusion in the PESOU SITES. Complete DMH1 and DMH2 as a minimum.

8) Complete TRM1 and TRM2 for the "Mannas Street & I-95" (#152) source area.

9) Complete DMH1 and DMH2 for the "Hawkins Dump" (#120) source area.

10) Page 3-34, under "Tailings Accumulations", second paragraph, last sentence. The state not is more that further characterization of the Coosawhi Tailings is unnecessary because it is currently being removed. Only a portion of the tailings are being removed. The remaining tailings and may impact on groundwater quality need to be evaluated and included in the JE.

11) Complete DMH1 and DMH2 for the Coal Tailings (#155). As groundwater investigations are required for State Contract #21 conduct these investigations during this work. The State does not believe that only using "available record" can elucidate chemical/physical characteristics.

12) Complete DMH1 and DMH2 for the Farmer Tailings (#4). The State does not believe that including "available records" can elucidate chemical/physical characteristics. Further, the State believes having an a grid using 150' centers will be adequate to complete Tasks. The grid would follow the Xtobe Sewer Over and stretch between Harrison Ave. and Commercial Ave. The State has looked at this task and find it will require about 100 borings to complete. From past investigations in the area, 30' depths should be adequate to define the extent of tailings. Further, some of the borings should be used to assist in establishing with Gas State contract #21 on the groundwater model for the RFS/JE SITES.

13) The "old" Gordonsville Gas Landfill should be included as part of the PESOU SITES. The landfill and Clark tailings as cover material in or day to day operations. ARTAPTOS C physicochemical tailings and the mixture of solid waste with tailings (These are three physicochemical labeled PESOU-SC-HPES-C-1, PESOU-SC-HPES-C-2, and PESOU-SC-HPES-C-3). Further, monitoring well logs and water quality results from 6 to 6 combining with document the existence of the tailings and the migration of COC's off site (APPENDIX C). Thus the landfill should be included as a source area.

14) Page 3-35, the statement is made that the Alice Mill site is reclaimed. This "reclamation" conclusion is limited only to "direct" human health exposure concerns, but not the State believes parts of the "Alice Mill" facility are still buried beneath the Alice Dump. Apparently, the Alice Mill is buried beneath the Alice Dump. The Alice Dump is not reclaimed, and much consideration needs to be give this site.

BUTTE-SILVER BOW
DEPARTMENT OF PUBLIC WORKS
Courthouse
Butte, Montana 59701
Phone: (406) 723-8262

RECEIVED
MAY 24 1994
MONTANA DEPARTMENT OF
AND ENVIRONMENTAL

May 23, 1994

Ms. Pat Potts, Environmental Specialist
Solid and Hazardous Waste Bureau
Solid Waste Program
Cogswell Building
Helena, MT 59620

Dear Pat:

Thank you for the opportunity to meet with you and John Dillard regarding the ground water monitoring requirements at the old Butte-Silver Bow Landfill License No. 20.

Based on our meeting, Butte-Silver Bow is faced with assessment monitoring at the old landfill but would like to suggest a possible subset of wells excluding well No. 4 for the table 2 constituents for the next monitoring event.

Butte-Silver Bow has experienced tremendous landfill costs both with the closure and construction of the new landfill and we are facing serious budget constraints to comply with the ninety day required sampling event timeframe.

Therefore we are requesting your approval to sample the subset of wells for Table 2 which will include BSB W1, BSB W2 and BSB W3. BSB W4 will be analyzed for Table 1 constituents and a VOC Blank will be used.

In addition, we are requesting your approval to combine the assessment monitoring with the fall sampling event in October, 1994. Per your instructions, Butte-Silver Bow will begin monitoring monthly water levels at the closed facility.

Called Gary:
Requested earlier
if possible, ~ August 19

Thank you for your cooperation and assistance to Butte-Silver Bow to complete our ground water monitoring requirements.

Sincerely,

Gary Keeler (PB)

Gary Keeler, Landfill Manager
Public Works Department

pb

cc: Pioneer Technical Services

PIONEER
TECHNICAL SERVICES, INC.
P.O. BOX 3445, BUTTE, MONTANA 59702 PHONE (406) 782-5177 FAX (406) 782-5866

FILE: Silver Bow, old Butte #20 grd wtr (corr)

April 5, 1994

RECEIVED
APR 11 1994
MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES

Ms. Pat Potts
Environmental Specialist
Solid and Hazardous Waste Bureau
P.O. Box 200901
Helena, Montana 59620-0901

Subject: Butte-Silver Bow Landfill Groundwater Sampling

Dear Ms. Potts:

Enclosed is the additional information which you requested regarding the latest groundwater sampling at the Butte-Silver Bow Landfill:

1. A brief discussion of the analytical results--prepared by Dave Tuesday; and

2. A copy of the inorganics chain-of-custody form.

A map, indicating the static water levels in each of the wells sampled and the estimated groundwater flow direction, will be forwarded to you as soon as it is completed being drafted. In here →
Please feel free to call at 782-5177 if you have additional comments or concerns.

Sincerely,

Shawn Bisch

Shawn Bisch
Environmental Engineer

cc. Dave Tuesday

Enclosures

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Old Silver Bow County Landfill - Round 2 groundwater analytical data

The analytical data from second round of sampling resemble, but do not duplicate, the first round. Both the analytes detected and the concentrations are different (see Table 1 for round 2 data summary). The discussion below will compare these data to previous data and to current MCL's; according to the regulations, action is required if groundwater concentrations exceed MCL's. Note that the previous volatile organics analytical method used was EPA 8240 and these analyses were done using EPA method 8260 (more compounds analyzed).

equipmt blank? – check SOP

QA/QC Samples (field blank and duplicate):
The field blank sample contained two detectable volatile organic compounds: chloromethane (1.8 ug/L) and 1,2-dichloroethane (1,2-DCA; 4.7 ug/L). Both compounds were detected at similar levels in other samples. These two analytes are suspect in other samples and should not be considered accurate, since they may have originated at the lab, from the sample bottles, from the preservative, or elsewhere. The field blank sample was collected in the field in the same type of sample container and was preserved in the same manner as the groundwater samples. The field blank consisted of J.T. Baker "Instra-analyzed" reagent grade water for environmental inorganic and organic trace analyses. The duplicate samples (well MW-A2, samples GW-5 and GW-6) showed excellent reproducibility for both the volatile organics and metals analyses. big deal

Well MBMG-2 (upgradient):
This well was used as the background or upgradient well for comparison with concentrations found in downgradient wells. Two volatile organic compounds were detected (carbon disulfide and chloroform), but both were detected at concentrations below the practical quantitation limit (PQL) for the instrument; no organics were detected in the previous round. Metals concentrations were low, at or slightly above the detection limit.

Well MW-A1 (North, shop area):
Four volatile organic compounds were detected, but two of them were detected at concentrations below the PQL (benzene and chloromethane). Tetrachloroethene (PCE; 1.8 ug/L) and 1,2-DCA (1.2 ug/L) were detected above the PQL; however, both chloromethane and 1,2-DCA were detected in the field blank and are considered suspect. Metals concentrations were low, slightly above the detection limit. The previous analyses detected ethylbenzene, toluene, xylene, and elevated lead in this well; none of the previous sampling results were corroborated during the second round of sampling. The compounds detected in this well were all below their respective MCL's or have no MCL. So – BS!

Well MW-A2 (Northeast):
Several volatile organic compounds were detected in this well, in both of the samples collected here: benzene (0.89J ug/L, below the PQL); carbon disulfide (1.5 and 2.7 ug/L); dichlorofluoromethane (15 and 16 ug/L); chloromethane (2.0 and 1.8 ug/L, detected in blank); 1,4-dichlorobenzene (1.7 and 1.8 ug/L); dichlorodifluoromethane (16 and 17 ug/L); 1,1-dichloroethane (1,1-DCA; 6.6 and 6.9 ug/L); 1,2-DCA (4.9 and 4.4 ug/L, detected in blank); 1,1-

dichloroethene (DCE; 0.33J and 0.35J, below the PQL); cis-1,2-DCE (91 and 92 ug/L); trans-1,2-DCE (0.94J and 1.0 ug/L, below the PQL); 1,2-dichloropropane (1.4 and 1.3 ug/L); methylene chloride (1.8 and 1.9 ug/L); PCE (6.9 and 7.0 ug/L); 1,1,1-trichloroethane (TCA; 8.8 and 9.1 ug/L); and, trichloroethene (TCE; 14 ug/L in both samples). In the metals analyses, cadmium, cobalt, iron, nickel, and zinc were also detected at elevated concentrations compared to the upgradient well, although only cadmium exceeded MCL's (23.1 and 27.1 ug/L).

Compared with the first round of sampling, six previously detected compounds were verified in this well (dichlorodifluoromethane, 1,1-DCA, 1,2-DCA, methylene chloride, PCE, and TCE), although 1,2-DCA was also found in the blank. Vinyl chloride was not corroborated from the first round analyses. Several additional volatile organic compounds were detected in the second round of sampling, primarily because of the expanded list of analytes compared to the first round.

Four analytes exceed MCL's in this well: cis-1,2-DCE (MCL = 70 ug/L); PCE (MCL = 5 ug/L); TCE (MCL = 5 ug/L); and, cadmium (MCL = 5 ug/L).

Well MW-A3 (east-center):
Several volatile organic compounds were detected in this well: benzene (2.1 ug/L); carbon disulfide (1.4 ug/L); dichlorofluoromethane (0.88 ug/L, below the PQL); 1,4-dichlorobenzene (1.9 ug/L); 1,1-DCA (1.1 ug/L); 1,2-DCA (3.3 ug/L, detected in blank); cis-1,2-DCE (36 ug/L); PCE (0.26 ug/L, below the PQL); 1,1,1-TCA (3.7 ug/L); TCE (1.4 ug/L); ethylbenzene (5.8 ug/L); m+p-xylenes (1 ug/L); and, o-xylene (0.65 ug/L, below the PQL). In the metals analyses, arsenic, cobalt, iron, thallium, and zinc were also detected at elevated concentrations compared to the upgradient well, although only thallium equalled the MCL (2 ug/L).

Compared with the first round of sampling, four previously detected compounds were verified in this well (benzene, dichlorofluoromethane, 1,1-DCA, and TCE). Vinyl chloride was not corroborated from the first round analyses. Nine additional volatile organic compounds were detected in the second round of sampling, primarily because of the expanded list of analytes compared to the first round. One analyte equalled the MCL: thallium (MCL = 2 ug/L).

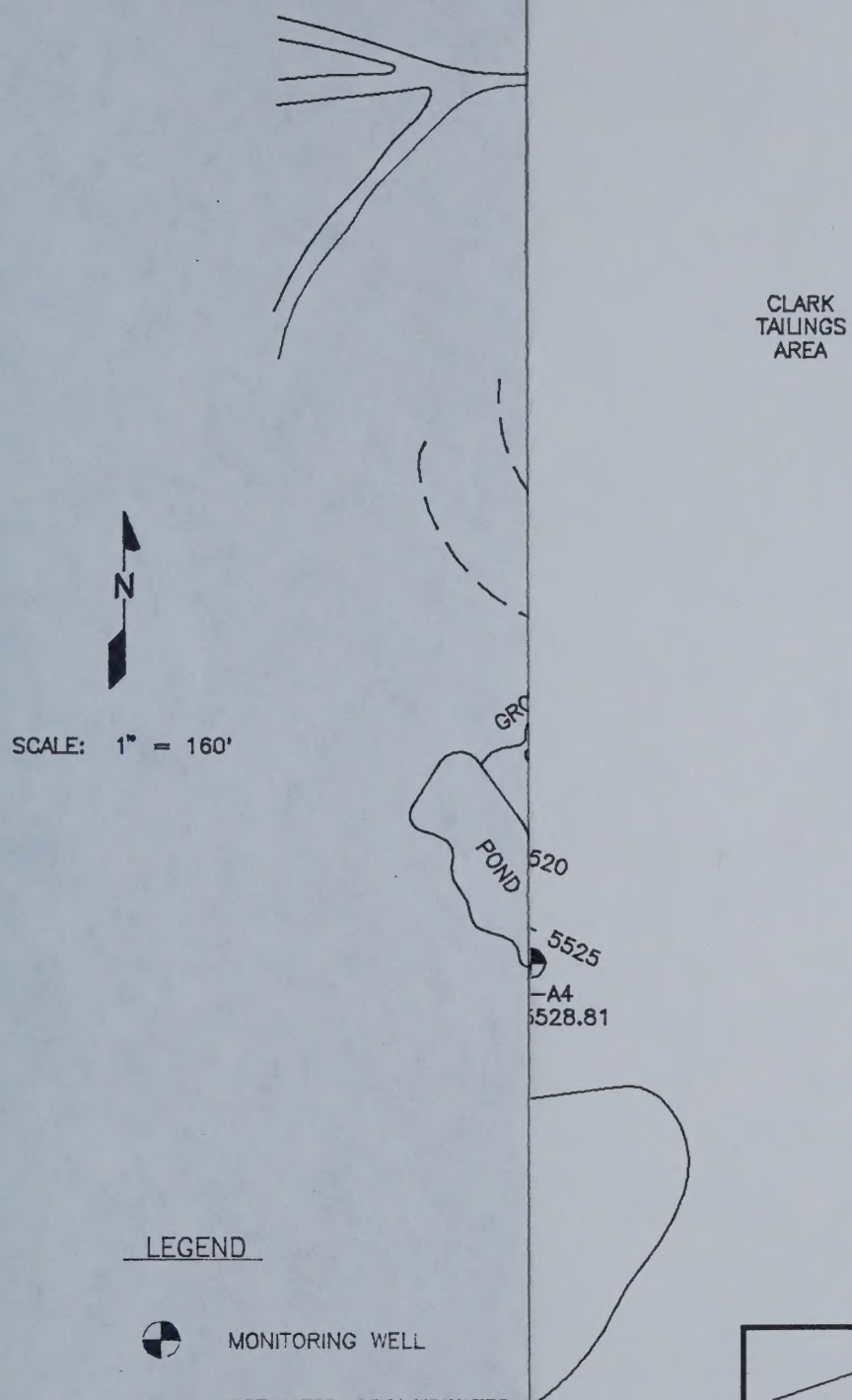
Well MW-A4 (Southeast):
Three volatile organic compounds were detected in this well, but one of them was detected at a concentration below the PQL (chloromethane). Carbon disulfide (3.9 ug/L) and 1,2-DCA (2.4 ug/L) were detected above the PQL; however, both chloromethane and 1,2-DCA were detected in the field blank and are considered suspect. Metals concentrations were low, similar to the upgradient concentrations. The previous analyses detected no analytes in this well; the previous sampling results were corroborated during the second round of sampling (except for carbon disulfide which was not analyzed in round one). The compounds detected in this well were all below their respective MCL's or have no MCL.

Conclusion:
The four MCL exceedences (2 confirmed from previous sampling, 2 new exceedences) in well MW-A2 will cause MDHES to require "assessment monitoring" using the expanded list of analytes. This sampling must be done within 90 days of receipt of these analytical results.

TABLE 1

ANALYTICAL DATA FOR WATER AND QA/QC SAMPLES (μg/L), OLD SILVER BOW COUNTY LANDFILL

SAMPLE NUMBER / WELL / ANALYTE:	BSB-GW-01 MBMG-2	BSB-GW-02 BSB-A1	BSB-GW-03 BSB-A4	BSB-GW-04 BSB-A3	BSB-GW-05 BSB-A2	BSB-GW-06 DUPL. OF GW-05	BSB-GW-07 VOC FIELD BLANK	DRINKING WATER MCL/MCLG
Benzene	<1.0	<1.0 (0.19J)	<1.0	2.1	<1.0 (0.89J)	<1.0 (0.89J)	<1:0	5
Carbon Disulfide	<1.0 (0.75J)	<1.0	3.9	1.4	1.5	2.7	<1.0	
Dichlorofluoromethane	<1.0	<1.0	<1.0	<1.0 (0.88J)	15	16	<1.0	
Chloroform	<1.0 (0.75J)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Chloromethane	<1.0	<1.0 (0.83J)	<1.0 (0.66J)	<1.0	2	1.8	1.8	
1,4-Dichlorobenzene	<1.0	<1.0	<1.0	1.9	1.7	1.8	<1.0	75
Dichlorodifluoromethane	<1.0	<1.0	<1.0	<1.0	16	17	<1.0	
1,1-Dichloroethane	<1.0	<1.0	<1.0	1.1	6.6	6.9	<1.0	
1,2-Dichloroethane	<1.0	1.2	2.4	3.3	4.9	4.4	4.7	5
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0 (0.33J)	<1.0 (0.35J)	<1.0	7
cis-1,2-Dichloroethene	<1.0	<1.0	<1.0	36	91	92	<1.0	70
trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0 (0.94J)	1	<1.0	100
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	1.4	1.3	<1.0	5
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	1.8	1.9	<1.0	
Tetrachloroethene	<1.0	1.8	<1.0	<1.0 (0.26J)	6.9	7	<1.0	5
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	3.7	8.8	9.1	<1.0	200
Trichloroethene	<1.0	<1.0 (0.40J)	<1.0	1.4	14	14	<1.0	5
Ethyl Benzene	<1.0	<1.0	<1.0	5.8	<1.0	<1.0	<1.0	700
m+p-Xylenes	<1.0	<1.0	<1.0	1	<1.0	<1.0	<1.0	
o-Xylene	<1.0	<1.0	<1.0	<1.0 (0.65J)	<1.0	<1.0	<1.0	
Arsenic	2	4	4	15	4	5		50
Barium	133	122	43	77	40	36		2000
Cadmium	0.3	0.7	<0.1	0.2	23.1	27.1		5
Chromium	<7	<7	<7	<7	7	<7		100
Cobalt	<9	<9	<9	22	32	30		
Iron	<13	22	<13	50900	729	509		
Lead	<1	2	<1	<1	<1	1		50 (15)
Mercury	<0.2	<0.2	0.2	<0.2	<0.2	<0.2		2
Nickel	<15	<15	<15	<15	90	90		100
Selenium	1	<1	3	<1	<1	<1		50
Thallium	<1	<1	<1	2	<1	<1		2
Zinc	<7	17	<7	918	18900	25000		



LEGEND

MONITORING WELL

ESTIMATED GROUNDWATER ELEVATION CONTOURS

ESTIMATED GROUNDWATER FLOW PATHS

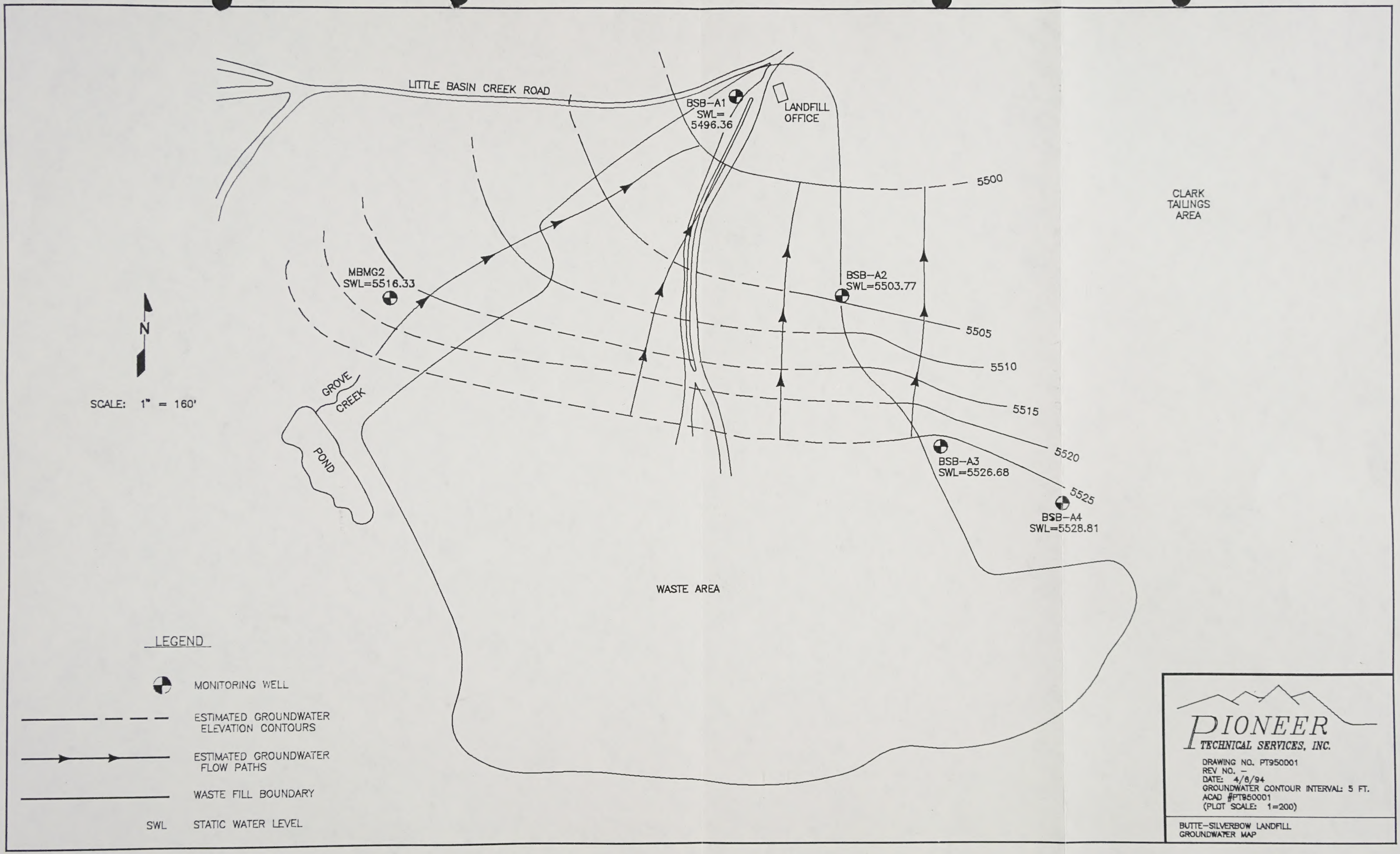
WASTE FILL BOUNDARY

SWL STATIC WATER LEVEL

PIONEER
TECHNICAL SERVICES, INC.

DRAWING NO. PT950001
REV NO. –
DATE: 4/6/94
GROUNDWATER CONTOUR INTERVAL: 5 FT.
ACAD #PT950001
(PLOT SCALE: 1=200)

BUTTE-SILVERBOW LANDFILL
GROUNDWATER MAP


LITTLE BASIN CREEK ROAD
BSB-A1
SWL=
5496.36
LANDFILL
OFFICE
5500
CLARK
TAILINGS
AREA
MBMG2
SWL=5516.33
BSB-A2
SWL=5503.77
N
5505
5510
5515
SCALE: 1" = 160'
GROVE
CREEK
POND
5520
BSB-A3
SWL=5526.68
5525
BSB-A4
SWL=5528.81
WASTE AREA
LEGEND
MONITORING WELL
ESTIMATED GROUNDWATER
ELEVATION CONTOURS
ESTIMATED GROUNDWATER
FLOW PATHS
WASTE FILL BOUNDARY
SWL
STATIC WATER LEVEL
PIONEER
TECHNICAL SERVICES, INC.
DRAWING NO. PT950001
REV NO. –
DATE: 4/8/94
GROUNDWATER CONTOUR INTERVAL: 5 FT.
ACAD #PT950001
(PLOT SCALE: 1=200)
BUTTE-SILVERBOW LANDFILL
GROUNDWATER MAP

CLOSED
BUTTE-SILVER BOW LANDFILL
LICENSE NUMBER 20

PIONEER TECHNICAL SERVICES

RESULTS OF SAMPLING, FEBRUARY 1994

MARCH 1994

IS LOCATED IN THE GROUNDWATER
MONITORING REPORTS ARCHIVE,
BOX NUMBER 7

RECEIVED 3/29/1994

File: Silver Bow Co., old Butte, (II) grd wtr (corr)

PIONEER
TECHNICAL SERVICES, INC.
P.O. BOX 3445, BUTTE, MONTANA 59702 PHONE (406) ~~494-4024~~ 782-5177 FAX (406) ~~494-1480~~ 782-5866

January 31, 1993

RECEIVED
FEB 01 1994
MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES
SOLID AND HAZARDOUS WASTE BUREAU

Ms. Pat Potts
MDHES Solid Waste Program
Cogswell Building
Helena, Montana 59620

RE: Comments on Pioneer's SOP's

Dear Ms. Potts:

Enclosed are my brief written responses to your comments regarding Pioneer's sampling at the Old Butte Landfill and corporate SOP's. Since these SOP's are general in nature, they do not address site-specific issues or procedures that are unique to the Old Butte-Silver Bow Class II Landfill.

Comment #1, Background well(s): Any of the three MBMG wells northwest of the landfill could be used as a background, as could well BSB-A4. I prefer not to use well BSB-A4 as it appears to be downgradient from a small portion of the landfill area, even though no contaminants were detected in the first sampling. The three MBMG wells are located hydraulically upgradient from the landfill, based on the groundwater flow map prepared by SRM. Of the three wells, I have selected MBMG #2 based on the completion specifications. It was drilled deeper than MBMG #1 by 4 feet (17 ft. vs. 21 ft.) and has 10 feet of screened interval rather than 5 feet. MBMG #2 is a 2-inch i.d. monitoring well, while MBMG #3 is a 4-inch i.d. well; the 2-inch well will require significantly less well purging volume (and time) than the 4-inch well. Therefore, I propose to use MBMG #2 as the background well for this sampling.

Comment #2, Table of analytical constituents: Upon review, the County has determined that Table 1 - Detection Monitoring suit should be analyzed at this time. (add dichlorodifluoromethane)

Comment #3, QA/QC Samples for analysis: Both a VOC trip blank sample and a duplicate sample (entire suite of analyses) will be collected for analysis. Probably well BSB-A2 will be used for the duplicate. An equipment rinsate from the decontaminated bailer may be collected if there are not dedicated bailers for each well; if there are dedicated bailers, as described in the SRM sampling plan, ? no rinsate sample will be collected. It would be more cost effective to purchase the bailers and dedicate one to each well, rather than submit a rinsate sample for an expensive analysis.

100% post-consumer paper & 100% vegetable based inks

Comment #4, List of wells to be sampled and order: First, the background well, MBMG #2 will be sampled (cleanest). Then BSB-A4, BSB-A3, BSB-A1, and BSB-A2 (and duplicate) will be collected. This order is roughly from the cleanest well (A4) to the most contaminated well(A2) and considers access and proximity.

SOP Comment A, PTS-SOP-DE-01: Pioneer will follow our Corporate Health and Safety Plan as it applies to landfill sites.

SOP Comment B, PTS-SOP-DE-02: All equipment will arrive at the site decontaminated to avoid transporting any off-site contaminants to the site. Equipment used will be decontaminated prior to leaving the site to avoid transporting any contaminants off the site.

SOP Comment C, PTS-SOP-FM-01: Pioneer does not currently have an explosimeter available; we measure headspace with a photoionization detector (MicroTIP). If these measurements are important, Pioneer can rent an explosimeter for the sampling.

SOP Comment D, PTS-SOP-S-01 and S-02: Soil sampling will not be done for this round of sampling, but in the event that Pioneer is involved in the drilling of additional wells, soil sampling will be performed. I wanted you to have a complete set of SOP's (same for PTS-SOP-GW-12).

where did you get them?

SOP Comment E, PTS-SOP-GW-05: I have reviewed the well completion forms and they include a surveyed elevation; this work will not be repeated. The surveying portion of the SOP only applies to previously unsurveyed wells.

SOP Comment F, PTS-SOP-GW-10: The 40-ml VOA vials will be checked for trapped air bubbles by inverting the vial and tapping. If bubbles are found, the sample will be discarded and resampled.

SOP Comment G, PTS-SOP-GW-12: See response above regarding why this SOP was included. The "vent hole" described is a small hole in the outer steel casing that allows any water spilled between the inner and outer casings to drain away. This hole is usually at the annular sealant level between the two casings, which is above ground level, but lower than the top of the casing. It would more correctly be called a drain hole. If this hole poses a problem, it can easily be deleted from the SOP.

Thank you for your review. I hope these responses will clarify the issues you raised. If you have any questions, comments or suggestions, please don't hesitate to call me at 782-5177.

Sincerely,

David S. Tuesday
Principal Hydrogeologist/Geochemist

File: Silver Bow Co.
old Butte (II)
grd wtr (corr)

PIONEER
TECHNICAL SERVICES, INC.
P.O. BOX 3445, BUTTE, MONTANA 59702 PHONE (406) 782-5177 FAX (406) 782-5866

back ground well(s)
network
Detection, vs. Assessmt.

RECEIVED
JAN 20 1994
MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES
SOLID AND HAZARDOUS WASTE BUREAU

January 18, 1993

Ms. Pat Potts
Solid Waste Program
Solid and Hazardous Waste Bureau
Montana Dept. of Health and
Environmental Sciences
Cogswell Building
Helena, MT 59620

Dear Pat:

Enclosed are Pioneer Technical Services, Inc., corporate SOP's for tasks associated with groundwater sampling for your review. Please let me know if you have any questions or need anything further. Thank You.

Sincerely,

Darla Haberman for...

David S. Tuesday
Principal Hydrogeologist/Geochemist

Encl.

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JAN 20 1994
MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES
SUP AND HAZARDOUS WASTE BUREAU

PTS-SOP-DE-01

STANDARD OPERATING PROCEDURE
PERSONNEL DECONTAMINATION PROCEDURES

All personnel must go through decontamination procedures whenever leaving a contaminated area. Decontamination procedures should be used in conjunction with methods to prevent contamination including minimizing contact with wastes and maximizing worker protection.

PROTECTION:

there is more yet.

1. Follow personal protective measures in the Site Safety Plan.

2. In the event that personnel decontamination becomes necessary, the outer more heavily contaminated items should be soap (nonphosphate)/tap water washed. Rinse the items in tap water.

3. Next, the inner, less contaminated items should be soap (nonphosphate)/tap water washed. Rinse the items in tap water.

4. Store the items separately so they are used in contaminated areas only.

5. For contaminants other than those found typically at uncontrolled hazardous waste sites, see the Health and Safety Manager.

EMERGENCY DECONTAMINATION:

1. If the decontamination procedure is essential to the life-saving process, decontamination must be performed immediately.

2. If heat related illness develops, protective clothing should be removed as soon as possible.

   WASH, RINSE AND/OR CUT OFF PROTECTIVE CLOTHING/EQUIPMENT

3. If medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Wrap the victim to reduce contamination of others.

4. Alert medical personnel to the emergency and instruct them about potential contamination. Instruct medical personnel about specific decontamination procedures.

5. Dispose contaminated clothing and equipment properly.

STANDARD OPERATIVE PROCEDURE
PERSONNEL DECONTAMINATION PROCEDURES

All personnel must go through decontamination procedures whenever leaving a contaminated area. Decontamination procedures should be used in conjunction with methods to prevent contamination including minimizing contact with wastes and maintaining worker protection.

PROTECTION:

1. Follow personnel protective measures in the Site safety plan.

2. In the event that personnel decontamination becomes necessary, the outer more heavily contaminated items should be soap (nonphosphate)/tap water washed. Rinse the items in tap water.

3. Next, the inner, less contaminated items should be soap (nonphosphate)/tap water washed. Rinse the items in tap water.

4. Store the items separately so they are used in contaminated areas only.

5. The contaminate other than those found typically at industrial hazardous waste sites, see the Health and Safety Manual.

EMERGENCY DECONTAMINATION:

1. If the decontamination procedure is essential to the life-saving process, decontamination must be performed immediately.

2. If heat related illness develops, protective clothing should be removed as soon as possible.

THEN, STEPS 3 TO 6 ARE FOR PROTECTIVE CLOTHING/EQUIPMENT

3. If medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Keep the victim to reduce contamination of others.

4. Alert medical personnel to the emergency and inform them about potential contamination. Inform medical personnel about specific decontamination procedures.

5. Dispose decontaminated clothing and equipment properly.

PTS-SOP-DE-02

STANDARD OPERATING PROCEDURE
EQUIPMENT DECONTAMINATION

or arriving

All equipment leaving the contaminated area of a site must be decontaminated. Decontamination methods include physical removal, chemical removal and a combination of both. Decontamination procedures, in some cases, are to be performed in the same level of protection used in the contaminated area of a site. However, decontamination personnel may be sufficiently protected by wearing one level lower protection. The following decontamination procedures are for typical uncontrolled hazardous waste sites. For a more specific or unusual contaminant such as dioxins, see the Site Health and Safety Plan. Decontamination procedures should be used in conjunction with methods to prevent contamination of sampling and monitoring equipment.

ORGANIC CONTAMINANTS:

1. Remove gross contamination physically with a disposable paper towel or with a water rinse using pressurized or gravity flow.

2. Wash equipment in a solution of soap (nonphosphate) and tap water with a stiff brush.

3. Triple rinse the equipment in tap water.

4. Triple rinse the equipment with deionized water.

5. Triple rinse the equipment with methanol. If testing for dioxins, a hexane triple rinse will be included as part of the decontamination.

INORGANIC CONTAMINANTS - HEAVY METALS:

1. Remove gross contamination with a water rinse using pressurized or gravity flow tap water.

2. Wash equipment in a solution of soap (nonphosphate) and tap water with a stiff brush.

3. Triple rinse the equipment with distilled water.

4. Rinse the equipment with a mixture of 10:1 Nitric acid in distilled water (10 parts water to 1 part Nitric acid).

5. Rinse the equipment again with distilled water.

EQUIPMENT USED FOR DECONTAMINATION:

1. Triple rinse equipment (brushes, buckets, tubs) used in the decontamination process with water, preferably pressurized.

2. Agitate the equipment used in the decontamination process in the soap/tap water solution. (The tub which holds the solution will only have the water rinse.)

3. Triple rinse equipment with tap water.

4. Place equipment in appropriate areas, so they are used only for decontamination purposes (label if necessary).

DISPOSAL OF DECONTAMINATION SOLUTIONS:

1. Proper disposal of the soap/tap water solution, the tap water rinse, and the deionized water rinse is to a proper waste water container.

2. Proper disposal of the solvent rinse is to a proper organic solvent waste container.

3. When contaminants have been identified, either in the solutions or elsewhere on the site, solutions should be disposed of appropriately. If they are hazardous (characteristic, listed, etc.) dispose of them as such.

5. WHEN USING OTHER THAN THE ABOVE MENTIONED SOLUTIONS, BE SURE TO CHECK WITH THE HEALTH AND SAFETY OFFICER AND THE PROJECT MANAGER. SOME SOLVENTS MUST BE EVAPORATED.

EFFECTIVENESS OF DECONTAMINATION:

1. Effectiveness of the decontamination procedures will be measured using field equipment rinsate blanks (see the site QA/QC Plan).

SUPERVISOR OVER THE DECONTAMINATION:

1. Triple rinse equipment (bucket, hacksaw, tool) used in the decontamination process with water, preferably pressurized.

2. Agitate the equipment used in the decontamination process in the isopropyl water solution. (Use the white side the solution will only have the water rinse.)

3. Triple rinse equipment with tap water.

4. Place equipment in disposable areas, so they are used only for decontamination purposes (label if necessary).

DISPOSAL OF DECONTAMINATION MATERIAL:

1. Proper disposal of the isopropyl water solution, the tap water rinse, and the deionized water rinse is to a proper waste water container.

2. Proper disposal of the solvent rinse is to a proper organic solvent waste container.

3. When contaminants have been identified, either in the solutions or elsewhere on the site, solvents should be changed as appropriately. If they are carcinogens (characteristic, listed, etc.) dispose of them as such.

5. WHEN DOING OTHER THAN THE ABOVE EXCEPTIONS SOLUTIONS, WE HAVE TO CHECK WITH THE REGION AND SAFETY OFFICER AND THE PROJECT MANAGER. SOME SOLVENTS MUST BE AVAIDEDED.

EFFECTIVENESS OF DECONTAMINATION:

1. Effectiveness of the decontamination procedure will be measured using field equipment rinses (blank) (see the site QA/QC plan).

PTS-SOP-SA-01

STANDARD OPERATING PROCEDURE
SOIL AND WATER SAMPLE PACKAGING AND SHIPPING

1. WATER SAMPLE PRESERVATION precedes if the sample to be packed is water.

2. Each of the samples will be placed in separate zip-lock bags to keep it clean, dry, isolated, and to protect the sample label. Samples will then be placed in a cooler which has been lined with a plastic bag. The samples will be surrounded with vermiculite to reduce movement and absorb any leakage. The garbage bag will then be tied to contain the vermiculite.

3. The DCO will double check the paper work (SAS, COC, ITR, etc.) to assure those samples recorded on the associated paper work are in the cooler. The DCO will then sign the chain-of-custody form to relinquish custody.

4. The DCO will then place the paper work in a sealed zip-lock bag and tape it to the inside of the cooler lid.

5. The cooler will be labeled with the appropriate shipping labels (NOS, flammable liquids, flammable solids, this side up, fragile, etc.).

6. The DCO will then close the cooler and affix an address label to the lid (a Federal Express label will also be affixed, if used, at this time).

7. The cooler will then be closed and chain-of-custody seals will be placed over the opening.

8. Tape will then be placed over the custody seals and around the cooler.

9. The cooler(s) will then be transported to a secure storage or to the shipping agent.

PTS-SOP-FM-01

STANDARD OPERATING PROCEDURE
PROCEDURE FOR USING AN ORGANIC VAPOR DETECTOR
PHOTO-IONIZATION TYPE (PID)

1. Check battery charge level. If in doubt, charge battery as described in manual.

2. Turn unit on. Verification of ultraviolet lamp operation can be made by quickly looking into sensor for purple glow of the lamp.

3. Perform zero and calibration procedures as described in operating manual. Calibration for specific compounds can be performed so that instrument response is proportional to the calibration gas concentration.

4. If so equipped, set alarm at desired level.

5. Once calibrated, unit is ready for use. Recalibrate at end of day to check for instrument drift.

6. Position intake assembly to be in close proximity to the area in question as sampling rate allows for only very localized readings.

7. A slow sweeping motion of the intake assembly will help prevent the bypassing of problem areas.

8. Be prepared to evacuate the area if preset alarm sounds. Operators utilizing supplied air systems may not need to consider this action.

9. Static voltage sources such as AC power lines, radio transmissions, or transformers may interfere with measurements. See operating manual for discussion of necessary considerations.

10. Regular cleaning and maintenance of instrument and accessories will assure representative readings.

11. As with any field instrument, accurate results depend on the operator being completely familiar with the operator's manual, and proper care for the instrument.

PTS-SOP-FM-03

STANDARD OPERATING PROCEDURE
FIELD MEASUREMENT OF pH

Field Procedures

1. Rinse glass beaker with sample water three times.

2. Rinse pH and temperature probes with deionized water.

3. Fill beaker with sample water.

4. Turn on meter and immerse pH probe and temperature electrodes in sample water. Stir sample for thorough mixing. Read and record pH to nearest 0.1 unit once pH reading has stabilized.

5. Rinse electrodes with deionized water and store in carrying case.

Instrument Calibration

Calibrate pH meter in the field at the beginning of each day of field work and when the standard check is out of calibration. Recheck calibration at end of day.

1. Rinse pH and temperature probes in deionized water.

2. Turn on meter and immerse pH and temperature probe in a pH 7 buffer solution. Calibrate meter to pH 7 allowing enough time for meter to stabilize.

3. Rinse pH and temperature probe with deionized water.

4. Immerse pH and temperature probe in either a pH 4 or a pH 10 buffer solution depending on whether expected pH of samples is above or below pH 7. If expected sample pH is above pH 7, use pH 10 solution for the second calibration. If expected sample pH is below pH 7, use pH 4 for the second calibration. Calibrate meter to second pH solution allowing enough time for meter to stabilize.

5. Rinse pH and temperature probe with deionized water.

6 Recheck meter calibration to a pH 7 calibration solution. Repeat the calibration process (Steps 2-4) if value for final pH check is more than 0.02 units from pH 7.0.

PTS-SOP-FM-05

STANDARD OPERATING PROCEDURE
FIELD MEASUREMENT OF SPECIFIC CONDUCTANCE

Field Procedures

1. Calibrate instrument as described in instruction manual. Usually the lowest standard is appropriate. Recalibrate at end of day and note any drift. Replace batteries and try fresh standard solutions if meter does not calibrate properly.

2. Rinse decontaminated glass beaker with sample water three times.

3. Fill glass beaker with water sample.

4. Rinse conductivity probe with deionized water and place probe in sample water.

5. Submerge conductivity probe in sample so that flow cell holes are immersed. Turn instrument on to appropriate scale for sample analysis. Read specific conductance and record to the nearest one micromhos/centimeter. Measure sample temperature to the nearest 0.1° C from conductivity meter after temperature has equilibrated.

6. Remove probe from sample and rinse with deionized water.

7. Correct conductivity reading to specific conductance (corrected to 25° C) by multiplying the conductivity valve by the temperature correction factor and then by the probe correction factor (unless unit has an automatic temperature correction).

Maintenance

1. Store meter in case during transport. Immerse probe in deionized water for storage.

2. Check batteries before taking meter into the field. Carry spare batteries and deionized water for rinsing probe.

3. Inspect probe for damage or dirt.

4. If meter readings are erratic, return meter and probe to factory for repair.

SUGGESTED OPERATING PROCEDURES
FIELD MEASUREMENTS OF SPECIFIC CONDUCTANCE

Field Procedure

1. Calibrate instrument as described in instruction manual. Usually the lower standard is appropriate. Conductivity at end of day and once any day. Replace batteries and try fresh standard solutions if meter does not maintain properly.

2. Rinse decontaminated glass beaker with sample water twice first.

3. Fill glass beaker with water sample.

4. Rinse conductivity probe with deionized water and place probe in sample water.

5. Submerge conductivity probe in sample so that flow cell holes are immersed. Turn instrument on to appropriate mode for sample analysis. Read specific conductance and record to 1% accuracy and microsiemens/centimeter. Compare sample temperature to the tempcal 0.1° C from conductivity meter since temperature has equilibrated.

6. Remove probe from sample and rinse with deionized water.

7. Correct conductivity reading to specific conductance (referenced to 25° C) by multiplying the conductivity value by the temperature correction factor and then by the probe correction factor (unless unit has an automatic temperature correction).

Maintenance

1. Store meter in case during transport. Immerse probe in deionized water for storage.

2. Check batteries before taking meter into the field. Carry spare batteries and deionized water for storing probe.

3. Inspect probe for damage or dirt.

4. If meter readings are erratic, return meter and probe to factory for repair.

PTS-SOP-FM-06

STANDARD OPERATING PROCEDURE
FIELD MEASUREMENT OF WATER TEMPERATURE

NOTE: Often, temperature is measured with a pH meter or the Specific conductance meter. If included as part of those instruments, use SOP for that instrument. Otherwise:

1. Provide two calibrated thermometers inside protective cases for field measurements.

2. Check thermometer for cracks or gaps in the mercury. If cracks or gaps are visible, thermometer will not be used.

3. When possible, measure temperature of surface water at midstream, submersing the thermometer for approximately one minute or until temperature stabilizes.

4. When in situ temperature measurements are not possible, draw sample of at least 200 milliliters into a decontaminated beaker or sample bottle as soon after sampling as possible.

5. Place thermometer in sample. Do not allow thermometer bulb to touch sides of beaker. Allow to equilibrate (about one minute).

6. Record temperature to nearest 0.5° C in field log book or on field data sheet.

7. On a quarterly basis, check field thermometers against NBS-calibrated laboratory thermometer. Agreement should be within 0.5° C.

SEAWATER TEMPERATURE PROCEDURE
FIELD MEASUREMENTS OF WATER TEMPERATURE

NOTE: Often, temperature is measured with a oil meter or the specific conductance meter. If installed as part of these instruments, use SOP for that instrument. Otherwise:

1. Prepare two calibrated thermometers inside protective cases for field measurements.

2. Check thermometer for cracks or gaps in the mercury. If cracks or gaps are visible, thermometer will not be used.

3. When possible, measure temperature of surface water at midship, submerging the thermometer for approximately one minute or until temperature stabilizes.

4. When in rough weather measurements are not possible, draw sample of at least 500 milliliters into a non-contaminating device or sample bottle as soon after sampling as possible.

5. Place thermometer in sample. Do not allow thermometer bulb to touch sides of bottle. Allow to equilibrate (about one minute).

6. Record temperature to nearest 0.5° C in field log book or on field data sheet.

7. On a quarterly basis, check field thermometers against mercury-calibrated laboratory thermometer. Agreement should be within 0.5° C.

STANDARD OPERATING PROCEDURE
SOIL SAMPLING

Biased Sampling

Samples are collected where spills or leaks of contaminants may have occurred. Investigators can determine these areas from site records or photographs or from direct observation of stained soils or areas lacking vegetation.

1. SURFACE SOIL SAMPLING

Surface sampling under biased conditions may be selected after considering factors such as type of contaminant, length of time the area has been contaminated, the type of soil and the past use of the area. Surface soil sampling usually includes the upper six inches of soil.

Surface Sampling Techniques and Equipment

A. Grab Sample

- The most desirable sample collection device would be the soil probe (oakfield tube, king tube). This device allows uniform depth.

- Alternative sample collection devices include stainless steel scoops or trowels and disposable teflon trowels. These devices often produce inconsistent depths.

B. Composite Sampling

- The most desirable method of compositing soil subsamples is with a large plastic or canvas sheet. The subsamples are mixed in the center of the sheet. Each corner is pulled up and toward the diagonally opposite corner. This process is done from each corner. After the soil is mixed, it is again spread out on the cloth into a relatively flat pile. The pile is quartered. A small scoop is used to collect small samples from each quarter until the desired amount of soil is acquired. Note: High concentrations of organic chemicals in soils can react with the plastic sheet.

- Subsamples are often collected in a five-point (star) pattern. At each point, a subsample of a predetermined depth is collected. The diagonal distance between points is commonly ten feet depending on the area of soil homogeneity.

STANDARD OPERATING PROCEDURE
SOIL SAMPLING

Planned Excavation

Samples are collected where soils or land of contaminants may have occurred. Investigators can observing areas from site records or photographs or from direct observation of stained soils or areas lacking vegetation.

I. Surface Soil Sampling

Surface sampling under biased conditions may be selected after considering factors such as type of contaminant, length of time the area has been contaminated, the type of soil and the past use of the area. Surface soil sampling usually includes the upper six inches of soil.

Equipment Selection Techniques and Procedures

A. Grab Sample

- The most desirable sample collection device would be to use a tube (artificial tube, Kimo tube). This device allows uniform depth.

- Alternative scoop collection devices include stainless steel scoops or trowels and disposable bailing trowels. These devices often produce inconsistent depths.

B. Composite Sampling

- The most desirable method of compositing soil subsamples is with a large plastic or metal sheet. The subsamples are mixed in the center of the sheet. Each corner is balled up and towed this diagonally composite bottom. This process is done from each corner. After the soil is mixed, it is again spread out on the cloth into a relatively flat pile. The pile is quartered. A small scoop is used to collect small samples from each quarter until the desired amount of soil is acquired. Note: Esp. concentrations of organic chemicals in a pile can react with the plastic sheet.

- Subsamples are often collected in a five-point (star) pattern. At each point, a subsample of a predetermined depth is collected. The diagonal distance between points is commonly ten feet depending on the area of soil homogeneity.

- Subsamples can also be collected in a three-point (triangular) pattern. At each point, a subsample of predetermined depth is collected. The diagonal distance between the points is commonly ten feet depending on the area of soil homogeneity.

2. SUBSURFACE SOIL SAMPLING

The need for biased sampling of subsurface soils should be evaluated by considering factors such as the precipitation, the type of soil and the length of time the site has been contaminated. If precipitation has moved contaminants into lower soil horizons, subsurface sampling may be appropriate. Subsurface sampling includes soil depths from 1 foot to 25 feet.

Subsurface Sampling Techniques and Equipment

Subsurface sampling can also be composite or grab sampling similar to surface sampling techniques.

A. Shallow Subsurface Sampling

- The hand auger may be used to collect subsurface samples up to four or five feet in depth. The auger is twisted into the soil. The auger destroys the soil's cohesive structure and stratigraphic character.

- The in situ soil recovery auger may be used to collect subsurface samples up to five feet. The auger accommodates a liner and provides fast cutting of the soil with very little soil disturbance.

B. Deep Subsurface Sampling

- A power auger mounted on a truck or trailer, a well drilling rig, or a backhoe can be used for sampling up to 25 feet or more in depth.

- Subsamples can also be collected in a three-point (triangular) pattern. At each point, a subsample of predetermined depth is collected. The distance distance between the points is commonly ten feet depending on the area of soil preconditioning.

3. SUBSURFACE SOIL SAMPLING

The need for biased sampling of subsurface soils should be evaluated by considering factors such as the proximity, the type of soil, and the depth of fill over the site. See Note contaminated. If practicable the moved cuttings should into lower soil horizons, subsurface sampling may be appropriate. Subsurface sampling includes soil depths from 1 foot to 12 feet.

Subsurface Sampling Techniques and Equipment

Subsurface sampling can be conducted by grab sampling similar to surface sampling techniques.

A. Shallow Subsurface Sampling

- The hand auger may be used to collect subsurface samples up to four or five feet in depth. The auger is twisted into the soil. The auger destroys the soil's cohesive structure and stratigraphic character.

- The in situ soil recovery sampler may be used to collect subsurface samples up to five feet. The sampler accommodates a liner and provides last cutting of the soil with very little soil disturbance.

B. Deep Subsurface Sampling

- A power auger mounted on a truck or trailer, a soil drilling rig, or a backhoe can be used for sampling up to 25 feet or more in depth.

PTS-SOP-S-02

STANDARD OPERATING PROCEDURE
SPLIT SPOON SAMPLING

Split Spoon Sampling allows for the taking of relatively undisturbed subsurface soil samples. Best sample results occur when sampling finer grained material. Coarser gravels and cobbles cause the spoon to become plugged or prevent spoon advancement. The split spoon can be either pounded in the ground using a standard 140-pound hammer to determine blow counts or can be hydraulically pressed into the sample interval using drill rig equipment. The procedure is as follows:

1. Arrive on-site with proper decontaminated sampling equipment.

2. Set up all equipment and begin drilling. Drilling will proceed to the top of the first sampling interval.

3. Thoroughly decontaminate sampling equipment and assemble.

4. Place assembled split spoon sampler down the casing or hollow stem augers. Collect sample by using a 140-pound hammer or by pressing the sampling equipment with drill rig hydraulics. If using a 140-pound hammer, mark three eight-inch intervals on sample rod with chalk and note number of blows for each of the eight-inch intervals.

5. Retrieve sampling equipment and take split spoon off sample rod. Open split spoon and log the lithology, keeping the proper orientation (top to bottom). Place sample in proper sample container.

6. Decontaminate sampler as per decontamination SOP, PTS-SOP-DE-02.

PTS-SOP-GW-05

STANDARD OPERATING PROCEDURES
ELEVATION SURVEY FOR MONITOR WELLS

1. Arrive at the site with appropriate equipment in good working condition.

2. Begin survey using a USGS elevation reference mark as a reference point. If none are available, establish an arbitrary reference point. The arbitrary reference point must be a solid fixed point that will not change throughout the project.

3. Record survey instrument readings in field note book using proper notation.

4. Survey all monitor well locations with an accuracy of ±0.01 foot.

5. Measure three elevations for each well including:

   a. top of the inner well casing (TOC);
   b. top of the outer protective casing (on the lip, not the cap); and
   c. finished concrete pad adjacent to the outer well casing.

6. Mark TOC for future water level measurements.

7. Return survey circuit to point of origin to complete the loop and determine if the survey "closed" to allowable limits of precision.

PTS-SOP-GW-10

STANDARD OPERATING PROCEDURE
PURGING AND SAMPLING WITH A BAILER

1. Using clean, noncontaminating equipment, e.g., an electronic level indicator (avoid indicating paste), determine the water level in the well, then calculate the fluid volume in the casing.

2. Attach a top or bottom discharging bailer to clean, fluorocarbon resin coated wire or single strand stainless steel wire for lowering and raising.

3. Purge well by bailing at least three bore volumes (as calculated above) or until pH (PTS-SOP-FM-03), specific conductance (PTS-SOP-FM-05), and temperature (PTS-SOP-FM-06) have stabilized, whichever is greater.

4. For sampling, lower bailer slowly until it contacts water surface, and allow it to sink slowly, minimizing disturbance or splashing.

5. Slowly raise bailer to surface. Do not allow bailer line to contact ground.

6. Use discharge device to slowly discharge sample into appropriate containers, or pour slowly from top of bailer.

7. Repeat Steps 4 through 6 as needed to acquire sufficient volume.

8. Preserve the sample directly into sample container, if necessary.

9. Check that a Teflon liner is present in cap if one is required. Secure the cap tightly. — check for bubbles in VOC samp

10. Label the sample bottle with an appropriate tag. Be sure to complete the tag with necessary information. Record the information in the field logbook and complete all chain-of-custody documents.

11. Place the properly labeled sample bottle in an appropriate carrying container (usually a cooler) maintained at 4° C throughout the sampling and transportation period.

12. Bailer will be thoroughly decontaminated after each use according to SOP-DE-02.

or will a disposal bailer be used? purge +/or sample

STANDARD OPERATING PROCEDURE
PURGING AND SAMPLING WITH A BAILER

1. Using steam, conventional cleaning equipment, e.g., an electronic level indicator (with a bailing pass), determine the water level in the well, then calculate the fluid volume in the casing.

2. Attach a rope or bottom discharging bailer to clean, fluorocarbon resin coated wire or single strand stainless steel wire for lowering and raising.

3. Purge well by bailing at least three bore volumes (as calculated above) or until pH (PTS-SOP-GW-03), specific conductance (PTS-SOP-GW-04), and temperature (PTS-SOP-GW-06) have stabilized, whichever is greater.

4. For sampling, lower bailer slowly until it contacts water surface, and allow it to sink slowly, minimizing disturbance or splashing.

5. Slowly raise bailer to surface. Do not allow bailer line to contact ground.

6. Use discharge device to slowly discharge sample into appropriate containers, or pour slowly from top of bailer.

7. Repeat steps 4 through 6 as needed to acquire sufficient volume.

8. Preserve the sample directly into sample container, if necessary.

9. Check that a Teflon liner is present in cap if one is required. Secure the cap tightly.

10. Seal the sample bottle with an approximate cap. Be sure to complete the lab with necessary information. Record chain information in the field logbook and complete all chain-of-custody documents.

11. Place the properly labeled sample bottle in an appropriate carrying container (usually a cooler) maintained at 4° C throughout the sampling and transportation process.

12. Bailer will be thoroughly decontaminated after each use according to SOP-GW-07.

PTS-SOP-GW-11

STANDARD OPERATING PROCEDURE
DEPTH TO WATER LEVEL MEASUREMENTS

1. Arrive at site with proper equipment, fully decontaminated and in working order. ✓good

2. Unlock well protection/security and test ambient air conditions with an organic vapor detector. Consider explosimeter LEL/vol gas meter

3. Place water level indicator down the well and measure depth using the measure point marked on the well casing.

4. Read depth in hundredths of an inch directly from graduated cable. Record measurement and pull cable up one foot, shake cable and probe and repeat measurement. The two measure should agree to within 0.01", if they do not, repeat measurements again.

5. Decontaminate all equipment before re-use.

PTS-SOP-GW-12

STANDARD OPERATING PROCEDURE
MONITOR WELL DESIGN AND CONSTRUCTION

A set procedure for designing and constructing monitoring wells cannot be listed. Every location within a site may vary depending on contamination encountered, lithology of the subsurface, and depth to groundwater. A technique that may work at one location may be inappropriate at the next. The following section discusses general guidelines for well design and construction, but actual well designs will depend on site conditions.

Wells drilled for a CERCLA investigation will be designed to specifications suggested by the site being investigated, provided such design presents no conflict with investigation sampling objectives. This policy will permit the site to incorporate any new wells into ongoing monitoring programs by ensuring that new wells are constructed in the same manner as existing wells. Conflicts may result when existing well construction is not suitable for the proposed sampling. For example: polyvinyl chloride (PVC) casing should not be used if the groundwater is expected to contain very high concentrations (2 % or more) of organic solvents, because the casing could slowly dissolve; stainless steel should not be used in highly acidic or basic groundwater (pH <3 or pH >10) due to corrosion concerns; teflon or HDPE, though expensive, should be used for these applications. These sort of problem situations should be resolved on a site specific, case-by-case basis. The method of well construction and the materials used in the casing and screen affect the quality of the well, and its utility for groundwater monitoring, throughout its lifetime. The elements of proper monitoring well construction presented serve as guides for any wells constructed for groundwater investigation. In addition, these guidelines can be applied to evaluate the adequacy of existing wells when sampling will be conducted from available wells.

Well Diameter

The diameter of the well casing will be the minimum that allows the sampling tool to be lowered to the desired depth. The diameter of the drilled borehole into which the casing is placed must be large enough for the casing and completion materials to fit. A minimum of 5 cm additional diameter is necessary if grout seals and sand filter pack are to be placed in the annulus.

Well Depth

Wells will be constructed to be depth discrete and to be sampled from one aquifer zone without interference from other zones. This requires provisions for grouting above, and if necessary,

STANDARD OPERATING PROCEDURES
MONITORING WELL DESIGN AND CONSTRUCTION

A set procedure for designing and constructing monitoring wells cannot be listed. Every location within a site may vary depending on contamination encountered, lithology of the subsurface, and depth to groundwater. A technique that may work at one location may be inappropriate at the next. The following section discusses general guidelines for well design and construction, but actual well designs will depend on site conditions.

Wells utilized for a CERCLA investigation will be designed to specifications developed by the site hydrogeologist, provided down during the preparation of a site-specific work plan, compliance requirements. This policy will permit the site to incorporate any new wells into ongoing monitoring programs by ensuring that new wells are constructed in the same manner as existing wells. Discrepancies may result when existing well construction is not suitable for the proposed sampling. For example, polyvinyl chloride (PVC) casing should not be used if the groundwater is expected to contain very high concentrations (1% or more) of organic solvents, because the casing could slowly dissolve; stainless steel should not be used in highly acidic or basic groundwater (pH <2 or pH >10) due to corrosion concentration of Mn, though expensive, should be used for these applications. These sort of problem situations should be resolved on a site specific, case-by-case basis. The method of well construction and the materials used in the casing and screen affect the quality of the well, and the priority for groundwater monitoring throughout its lifetime. The elements of proper monitoring well construction described serve as guides for any wells constructed for groundwater investigation. In addition, these guidelines can be applied to evaluate the adequacy of existing wells when sampling will be conducted from available wells.

Well Diameter

The diameter of the well casing will be the minimum that allows the sampling tool to be lowered to the desired depth. The diameter of the drilling borehole into which the casing is placed must be large enough for the casing and cement/bentonite material to fill. A minimum of 2 cm additional diameter is necessary if gravel and sand filter pack are to be placed in the annulus.

Well Depth

Wells will be constructed to an depth, diameter and to be sampled from one aquifer zone without interference from other zones. This requires provisions for grouting above, and if necessary,

below the well screen on the outside of the casing. The location of the screen will be important for sampling, since it has an impact on sampling of immiscible organics. Sampling of less dense or more dense organics, which float or sink in an aquifer, will require the screen to be placed at an appropriate depth.

Well Casings/Screens

Well casings and screens will be constructed of materials with the least potential for affecting the water quality parameters of the sample. Guidance regarding casing and screen material selection criteria is presented in various USEPA guidance documents. Well casings will be cleaned and protected from contamination prior to their installation; frequently, casing and screen materials are available precleaned from the factory. During installation, casing materials that will contact groundwater (screens and bottom cap) will be handled using clean protective gloves, to insure that no contaminants are introduced from hands or unclean gloves.

Well Drilling

Drilling method selection will be based on minimizing both the disturbance to the geologic materials penetrated, and the introduction of air, fluids, and muds. Organic drilling muds or additives will be avoided. Advantages and disadvantages of various drilling methods are also discussed in USEPA guidance documents.

Monitoring Well Filter Pack and Annular Sealant

The materials used to construct the filter pack should be chemically inert (e.g., clean quartz sand, silica, or glass beads), well rounded, and dimensionally stable. Fabric filters should not be used as filter pack materials. Natural gravel packs are generally not acceptable, excepting if a sieve analysis is performed to establish the appropriate well screen slot size and the chemical inertness of the filter pack materials are determined in the anticipated environments.

The materials used to seal the annular space must prevent the migration of contaminants to the sampling zone from the surface or intermediate zones and prevent cross contamination between different aquifer zones. The materials should be chemically compatible with the anticipated contaminants to ensure seal integrity during the life of the monitoring well and chemically inert so they do not affect the quality of the groundwater samples. The permeability of the sealants should be at least two orders of magnitude less than the surrounding formation, except in clays where equal permeability is acceptable. An example of an appropriate use of annular sealant material is using a minimum of two feet of certified sodium bentonite pellets immediately over the filter pack when in a saturated zone. The pellets are

below the well screen on the outside of the casing. The location of the screen will be important for sampling, since it has an impact on sampling of desirable organisms. Sampling of less dense or more dense organisms, which float or sink in an aquifer, will require the screen to be placed at an appropriate depth.

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Well Drilling

Drilling method selection will be based on minimizing cost, the distances to the geologic materials penetrated, and the improvement of air, fluids, and cuttings. Cleanup drilling muds or additives will be avoided. Discussions and discussions of various drilling methods can also discussed in USEPA guidance documents.

Monitoring Well Filter Pack and Annular Seals

The materials used to construct the filter pack should be chemically inert (e.g., clean quartz sand, silica, or glass beads), well rounded, and dimensionally stable. Metal filters should not be used as filter pack materials. Natural clayed pacts are typically not acceptable. Construction of a pilot well is performed to establish the appropriate well screen size and the specific locations of the filter pack materials are determined in the anticipated environment.

The materials used to seal the annular zones must prevent the migration of contaminants in the sampling zone from the surface or intermediate zones and prevent cross contamination between different aquifer zones. The materials should be chemically compatible with the anticipated contaminants in the sampling zone. Integrity during the life of the monitoring well and chemically inert so they do not affect the quality of the groundwater samples. The permeability of the material should be at least two orders of magnitude less than the surrounding formation, except in cases where equal permeability is acceptable. An example of in-place where equal permeability is acceptable. An example of an appropriate use of annular sealant material is using a bentonite or two foot of material sodium bentonite pellets immediately over the filter pack when in a saturated zone. The pellets are

most appropriate in a saturated zone because they will be within the column of water and thereby create an effective seal. Coarse grit sodium bentonite is likely to hydrate and bridge before reaching the filter pack. A cement and bentonite mixture, bentonite chips, or antishrink cement mixtures should be used as the annular sealant in the unsaturated zone above the certified-bentonite pellet seal and below the frost line. Again, the appropriate clay must be selected on the basis of the environment in which it is to be used. In most cases, sodium bentonite is appropriate. The addition of bentonite to the cement mixture should generally be in the amount of 2 to 5 percent by weight of cement content. This will aid in reducing shrinkage and heat generation and will control the time required for setting. Calcium bentonite may be more appropriate in calcic sediments/soils due to reduced cation exchange potential. Clays should be pure, i.e., free of additives that may affect groundwater quality. From below the frost line, the concrete cap should blend into a four-inch thick apron extending two feet or more from the outer edge of the borehole.

The untreated sodium bentonite seal should be placed around the well casing either by dropping it directly down the borehole or putting the bentonite between the outer driven casing and the well casing as the outer casing is removed. Both of these methods present a potential for bridging. In shallow monitoring wells, a tamping device should be used to reduce this potential. In deeper wells, it may be necessary to use a tremie pipe to insure that the bentonite is placed in the desired location. In either case, a spacing differential of 3 to 5 inches should exist between the outer diameter of the well casing and the inner diameter of the driven casing or the surface of the borehole to facilitate emplacement of the filter pack and annular sealant. Volumes of these required materials should be calculated and compared to actual amounts used to establish their correct subsurface distribution. The actual volume of materials used is determined during well construction. Discrepancies between calculated volumes and actual volumes used, especially if less is used require explanation. The cement-bentonite mixture should be prepared using clean water and placed in the borehole using a tremie pipe. The tremie method ensures good sealing of the borehole from the bottom.

The remaining annular space should be sealed with expanding cement to provide for security and an adequate surface seal. Locating the interface between the cement and bentonite-cement mixture below the frost line serves to protect the well from damage due to frost heaving. The cement should be placed in the borehole using the tremie method.

Upon completion of the well, installation of a suitable threaded or flanged cap or compression seal should be placed or locked in properly to prevent either tampering with the well or the

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entrance of foreign material into it. A one-quarter inch vent hole pipe provides an avenue for the escape of gas. Placement of concrete or steel bumper guards around the well will prevent external damage by a vehicular collision with the exposed casing.

? No

Well Intake Design

The intake of the monitor well should be designed and constructed to: (1) allow sufficient groundwater flow into the well for sampling; (2) minimize the passage of formation materials (turbidity) into the well; and, (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

For wells completed in unconsolidated materials, the intake of a monitoring well should consist of a screen or slotted casing with openings sized to ensure that formation materials are prohibited from passing through the well during development. Extraneous fine-grained material (clays and silts) that has been dislodged during drilling may be left on the screen and the water in the well. These fines should be removed from the screen and filter pack during development of the well. Commercially manufactured screens or slotted casings should be used; field slotting of screens is not acceptable.

The annular space between the face of the formation and the screen or slotted casing should be filled to minimize passage of formation materials into the well. The driller should, therefore, install a filter pack in each monitoring well that is constructed on-site. Furthermore, in order to ensure discrete sample horizons, the filter pack should extend no more than two feet above the well screen.

Well Development

After monitor well installation, natural hydraulic conductivity of the formation should have been restored and all foreign sediment removed to ensure turbid-free groundwater samples.

A variety of techniques are available for developing a well. To be effective, they require reversals or surges in flow to avoid bridging by particles, which is common when flow is continuous in one direction. These reversals or surges can be created by using surge blocks, bailers, or pumps. Formation water should be used for surging the well. Any contaminated waters produced during development will be containerized for proper disposal. In low-yielding water-bearing formations, an outside source of water may sometimes be introduced into the well to facilitate development. In these cases, this water should be chemically analyzed to evaluate its potential impact on in-situ water quality. The driller should not use air to develop the wells. All developing equipment and materials used for well construction should be decontaminated prior to use.

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Documentation of Well Design and Construction

Information on the design and construction of wells will be documented and may include:

- Date/time of construction
- Drilling method and drilling fluid used
- Well location
- Bore hole diameter and well casing diameter
- Well depth
- Drilling and lithologic logs
- Casing materials
- Screen materials and design
- Casing and screen joint type
- Screen slot size/length
- Filter pack material/size, grain analysis (D10)
- Filter pack volume calculations
- Filter pack placement method
- Sealant materials (percent bentonite)
- Sealant placement method
- Surface seal design/construction
- Well development procedure
- Type of protective well cap
- Ground surface elevation
- Top of monitoring well casing elevation
- Top of protective steel casing elevation
- Detailed drawing of well (include dimensions)

CLOSED
BUTTE-SILVER BOW LANDFILL
LICENSE NUMBER 20

SPECIAL RESOURCE MANAGEMENT

ASSESSMENT SAMPLING RESULTS, APRIL 1993

MAY 1993

IS LOCATED IN THE GROUNDWATER MONITORING REPORTS ARCHIVE, BOX NUMBER 7

RECEIVED 5/19/1993

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 5 MAR 84

TO

John Geach

SWMB Rm 201 Cogswell 59620

HELENA

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
- [ ] PER PHONE CALL
- [ ] AS REQUESTED
- [ ] RECOMMENDATION
- [ ] FOR COMMENT
- [ ] REPLY FOR SIGNATURE OF
- [x] FOR INFORMATION
- [ ] RETURNED
- [ ] INITIALS
- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

REMARKS If you can't get well data from Bob B. let me know. Hope this is of help.

RECEIVED

MAR 07 1984

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES SOLID WASTE SECTION

FROM

Dave Jones

SCS - BZN

GPO : 1982 -385-528/5030

FORM AD-514 (8-64)

GROVE CREEK PROJECT W.Q. BRIEFING NOTES

EXISTING SURFACE WATER

- Excellent in upper watershed. High flows carry dissolved organics and coarse sediment. Low flow turbidity due to Fe & Mn.

- Base flow changed very little in existing bypass pipe.

- Zinc Concentrations increase in reach from tailings to Blackfai Creek due to tailings deposited in reach.

Subsurface Water

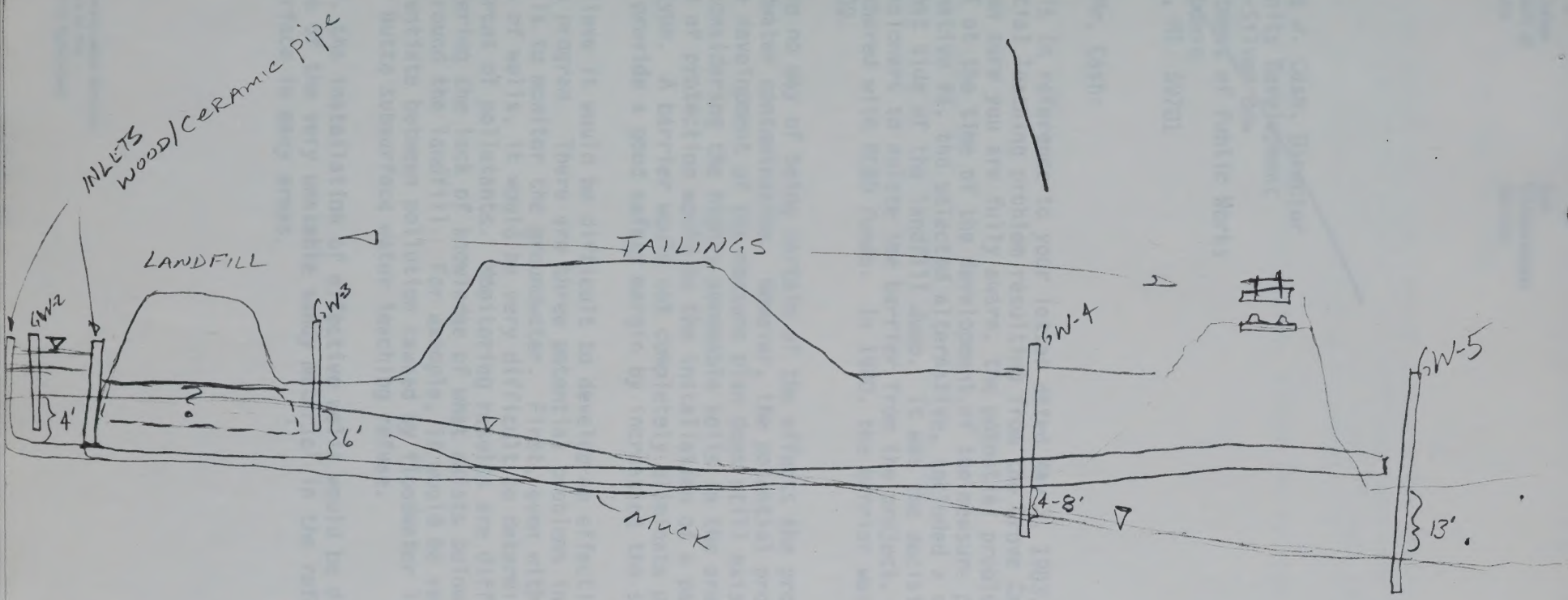
- Excellent in upper watershed
- After landfill relative to upper watershed

SO_4	increases	40	fold
Fe	"	2500	"
Mn	"	4000	"
Zn	"	6000	"
NO_3	"	10	"

- After tailings relative to upper watershed

SO_4	increased	15	fold
Fe	"	500	"
Mn	"	1000	"
Zn	"	1200	"

ROUGH SKETCH GROUND WATER



X-SECTION ALONG BYPASS PIPE - NO SCALE

Dave Jones

United States
Department of
Agriculture

Soil
Conservation
Service

P. O. Box 970
Bozeman, MT 59715

May 31, 1983

Thomas J. Cash, Director
Community Development
Butte-Silver Bow
Department of Public Works
Courthouse
Butte, MT 59701

Dear Mr. Cash:

This is in reference to your letter dated May 3, 1983, concerning the potential leaching problem resulting from the Grove Creek RC&D project. As I am sure you are fully aware, the potential problem was discussed in detail at the time of the development of the measure plan for the project. Alternative #4, the selected alternative, included a saturation barrier on the west side of the landfill dump. It was the decision of the Council of Commissioners to delete the barrier from the project, since it could not be cost shared with RC&D funds. In 1980, the barrier was estimated to cost $15,000.

We have no way of being certain of the effects the project will have on groundwater contamination. However, the potential problem as discussed in the development of the measure plan does still exist. This is especially true considering the highly permeable soils in the area. The most positive method of protection would be the installation of a permanent barrier of some type. A barrier would not completely eliminate potential problems, but would provide a good safety margin by increasing the seepage path.

We believe it would be difficult to develop an effective groundwater monitoring program. There are three potential problems in establishing a series of wells to monitor the groundwater. First, even with a comprehensive series of wells, it would be very difficult to determine exactly the source or sources of pollutants. Monitoring results are difficult to assess considering the lack of knowledge of what exists below the surface in the area around the landfill. For example, it would be very difficult to differentiate between pollution caused by floodwater leaching refuse versus Timber Butte subsurface water leaching refuse.

Second, the installation of effective wells would be difficult and expensive because of the very unstable sandy material in the refuse materials below the surface in many areas.

United States
Department of
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Second, the installation of effective wells would be difficult and expensive because of the very unstable sandy material in the refuse materials below the surface in many areas.

Third, the acidic tailings tend to increase the amount of pollutants that can leach into the ground water. Tailings have been used for cover material on the flank of Timber Butte. It is not known if they were used near the flood channel. This further complicates interpretations of well monitoring results.

If we can be of further assistance, please let us know.

Sincerely,

Glen H. Loomis
State Conservationist

cc:
Ronald J. Nadwornick, DC, SCS, Whitehall
Irving J. Nelson, RC&D Coordinator, SCS, Butte
Donald J. Anderson, AC, SCS, Missoula

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P. O. Box 970, Bozeman, Montana 59715

EN--Grove Creek Water Quality June 8, 1979

Homer Moore
State Conservation Engineer
Soil Conservation Service
Bozeman, Montana

Following is the existing water quality summary of Grove Creek and recommended constraints to presently known alternatives.

1. Water from the upper portion of the watershed is of excellent quality. During high flows. dissolved organics and coarse sediment are expected to be present. During low flows the iron and manganese content provide a slight turbidity to the water.

2. As the base flow passes under the landfill and tailings area via the bypass drain, the quality of water is changed very little. Sediments eroded from the tailings have been deposited between the drain outlet and Balcktail Creek. As the water passes over these sediments, zinc shows a significant increase.

3. Runoff from the tailings area is acidic and contains high concentrations of metals. Presently it is not known whether the majority of the metals are in the sediment or in the dissolved state.

Snowmelt runoff from and across the tailings can result in a 6 to 12 fold increase of copper and a 9 to 25 fold increase of zinc in Silver Bow Creek. The existing metal concentrations of Silver Bow are marginal for aquatic life. The increased levels of metals would be toxic to aquatic life.

If future monitoring shows that a greater portion of the metals are in the eroded sediment, then a settling pond on the tailings with a short retention time and automatic decanting would be recommended.

4. The ground water moving beyond the landfill and the tailings area is degraded by leachates. The effect on beneficial use of this water is not known, yet it is below standards for several uses.

Any ponding of water behind the landfill, on the landfill or tailings area should be avoided. (note exception in paragraph three above.)

Any water conveyance across the landfill or tailings should be lined for minimal seepage.

P. O. Box 970, Bozeman, Montana 59715

EN--Grove Creek Water Quality June 6, 1979

Homer Moore
State Conservation Engineer
Soil Conservation Service
Bozeman, Montana

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Any water conveyance across the landfill or tailings should be lined for minimal seepage.

Runoff from Timber Butte should not be allowed to pond against or on the tailings and if possible, should be diverted around the tailings.

5. Runoff from the Colorado tailings has high levels of zinc, copper, manganese, lead, cadmium, and arsenic. Any discharge of diverted water over the tailings would leach a high load of these metals into Silver Bow Creek.

Any sediment used to cover the Colorado tailings should be settled out beside and mechanically moved onto the tailings.

6. Complete diversion of the Grove Creek base flow would not greatly affect Blacktail Creek and Silver Bow Creek. During storm runoff or snowmelt the loss of up to 55 cfs dilution water for tailings runoff, sediment leachate, and stockyard drainage would affect Blacktail and Silver Bow to the point where Grove Creek diverted water reenters Silver Bow Creek.

David J. Jones
Environmental Engineer
Field Support Staff

cc:
Wallace Jolly, Asst. State Conservationist (Water Res.), SCS, Bozeman
Bob Remer, RB/WS Planning Staff Leader, SCS, Bozeman
Ron Nadwornick, DC, SCS, Whitehall

DJJones:ebg:6/8/79

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David G. Jones
Environmental Engineer
Field Support Staff

cc:
Wallace Dolly, Asst. State Conservationist (Water Res.), SCS, Bozeman
Bob Bauer, RB/WS Planning Staff Leader, SCS, Bozeman
Ron Hadsworth, DC, SCS, Whitehall

DJJones:sdg:6/8/79

United States Department of Agriculture
Soil Conservation Service
P. O. Box 970
Bozeman, Montana
59715

SUBJECT: RD--RC&D - Grove Creek Project Measure Environmental Evaluation

DATE: November 26, 1979

TO: Van K Haderlie
State Conservationist
Soil Conservation Service
Bozeman, Montana

Results of the environmental evaluation indicate to us that a formal environmental impact statement will not be necessary for developing and implementing the Grove Creek RC&D project measure. Consultation with the U.S. Fish and Wildlife Service; the Montana Department of Fish, Wildlife and Parks; and the State Water Quality Bureau indicate that only positive environmental benefits are associated with this project.

This decision is based on the seven alternatives as presently formulated. A departure from these alternatives could necessitate further evaluation.

Attached is a summary of the evaluation.

R. F. Batchelor
Leader, Environmental Evaluation Team

Attachment

cc: (with attachment)
Robert Remer, RB/WS Staff Leader, SCS, Bozeman
Ron Hadwornick, DC, SCS, Whitehall
Don McAndrew, AC, SCS, Bozeman
Wallace Jolly, Asst. State Conservationist (WR), SCS, Bozeman
Homer Gore, State Conservation Engineer, SCS, Bozeman
Robert Lohmiller, State Resource Conservationist, SCS, Bozeman
Dave Jones, Environmental Engineer, SCS, Bozeman
Jerry Schaefer, Economist, SCS, Bozeman

United States Department of Agriculture
Soil Conservation Service
P. O. Box 970
Bozeman, Montana
59715

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Dave Jones, Environmental Engineer, SCS, Bozeman
Jerry Schaefer, Economist, SCS, Bozeman

Grove Creek Environmental Evaluation

For environmental evaluation, the Grove Creek RC&D Measure Plan has been divided into two segments: the headwaters of Grove Creek to the proposed sediment trap adjacent to the garbage cells, and from the sediment trap downstream to Blacktail Deer Creek. The lower portion is characterized as an urban/industrial area while the upper watershed is rural/suburban. Principal watershed problems such as flooding, water quality degradation, and sedimentation are especially prevalent in the lower portion of the watershed.

Grove Creek is characterized as a man-altered intermittent stream. The stream channel of the upper watershed has been altered by channel realignment from past road construction and a breached dam. During periods of flow, high quality water exists in this portion of Grove Creek. The lower section has been substantially altered for many years through the placement of mine tailings and a landfill, plus urban encroachment on the drainageway. Urban encroachment on the flood plain has resulted in channel realignment, reduction in flow capacities, and inadequate road crossings.

The principle environmental problems existing in the watershed are (1) sedimentation throughout Grove Creek, and (2) degradation of water quality from leaching of mine tailings and landfill garbage in the lower watershed. The leachates are adversely affecting the groundwater quality to an unknown degree and extent.

The urban/suburban nature of the watershed provides little if any wildlife habitat. No rare or endangered plants or animals are known to occur within the boundaries of the watershed. The intermittent nature of Grove Creek provides no aquatic or fishery resources of any significance. The intermittent nature of the stream provides few if any natural riparian communities within the watershed. Eighteen acres of wetland Type 3 (inland shallow freshwater marsh) occur in the lower reach of the watershed immediately adjacent to Interstate Highway 90 and Lexington Avenue. The value of this wetland to water birds is much reduced because of its close proximity to the interstate highway.

The future without project action will result in further degradation of water quality and continued sedimentation of major portions of the lower watershed and receiving waters. Heavy metals (zinc and copper) contamination and sediment deposition from Grove Creek into the lower quarter mile of Blacktail Deer Creek will continue to depress the biological productivity of this short stream section. Heavy metals continue downstream to adversely affect Silver Bow Creek. There will be increased groundwater contamination. Further development of the upper watershed will likely increase sedimentation and compound existing stream channel capacity problems downstream.

The seven alternatives that have been developed have varying effects on solving environmental problems within the watershed. The analysis compares each alternative with the anticipated future action without project. Table 1 summarizes the construction elements of the alternatives. Table 2 summarizes the effects each alternative has on environmental quality.

Grove Creek Environmental Evaluation

For environmental evaluation, the Grove Creek RC&D Measure Plan has been divided into two segments: the headwaters of Grove Creek to the proposed sediment trap adjacent to the garbage cells, and from the sediment trap downstream to Blackhall Deer Creek. The lower portion is characterized as an urban/industrial area while the upper watershed is rural/suburban. Principal watershed problems such as flooding, water quality degradation, and sedimentation are especially prevalent in the lower portion of the watershed.

Grove Creek is characterized as a man-altered intermittent stream. The stream channel of the upper watershed has been altered by channel realignment from past road construction and a breached dam. During periods of flow, high quality water exists in this portion of Grove Creek. The lower section has been substantially altered for many years through the placement of mine tailings and a landfill, plus urban encroachment on the floodplain. Urban encroachment on the flood plain has resulted in channel realignment, reduction in flow capacities, and inadequate road crossings.

The principle environmental problems existing in the watershed are (1) sedimentation throughout Grove Creek, and (2) degradation of water quality from leaching of mine tailings and landfill garbage in the lower watershed. The leachates are adversely affecting the groundwater quality to an unknown degree and extent.

The urban/suburban nature of the watershed provides little if any wildlife habitat. No rare or endangered plants or animals are known to occur within the boundaries of the watershed. The intermittent nature of Grove Creek provides no aquatic or fishery resources of any significance. The intermittent nature of the stream provides low if any natural riparian communities within the watershed. Fourteen acres of wetland type 3 (inland shallow freshwater marsh) occur in the lower reach of the watershed immediately adjacent to Interstate Highway 80 and Lexington Avenue. The value of this wetland to water birds is much reduced because of its close proximity to the Interstate Highway.

The future without project action will result in further degradation of water quality and continued sedimentation of major portions of the lower watershed and receiving waters. Heavy metals (zinc and copper) contamination and sediment deposition from Grove Creek into the lower quarter mile of Blackhall Deer Creek will continue to degrade the biological productivity of this short stream section. Heavy metals continue downstream to adversely affect Silver Bow Creek. There will be increased groundwater contamination. Further development of the upper watershed will likely increase sedimentation and compound existing stream channel capacity problems downstream.

The seven alternatives that have been developed have varying effects on solving environmental problems within the watershed. The analysis compares each alternative with the anticipated future action without project. Table 1 summarizes the construction elements of the alternatives. Table 2 summarizes the effects each alternative has on environmental quality.

Anticipated Future Action Without Project

In discussion with project sponsors, the following anticipated events are likely to occur without project action. Upon the expected collapse of the existing wood culvert beneath the mine tailing and landfill, an emergency channel for Grove Creek would likely be constructed around the landfill. The capacity of the emergency channel would be about the same as the present wood culvert (55 cubic feet per second). The discharge of floodwaters from this channel would flow onto the mine tailings area, eroding a channel to the railroad track. The resulting discharge below the railroad track would likely carry tailings sediments into lower Grove Creek and receiving waters. These sediments are acidic and are known to contain heavy metals.

Alternative One

This alternative eliminates the transport of sediments from the upper watershed to the lower watershed via Grove Creek. It does not address sedimentation problems arising in the lower watershed. Flood peaks in lower Grove Creek will be increased by 77 cubic feet per second. Overland flow to Silver Bow Creek through the racetrack and cemetery, hereafter referred to as the north drainageway, would be reduced from 125 cfs to 26 cfs. Erosion of mine tailings would be increased due to flood waters overtopping the riprapped channel and eroding the tailings banks. This alternative does not solve the continued degradation of ground and surface waters in the lower watershed.

It is assumed that base flow in lower Grove Creek will infiltrate the rock riprapped channel constructed through the mine tailings, resulting in the elimination of base flow in much of lower Grove Creek.

Alternative Two

This alternative eliminates the transport of sediments from the upper watershed to the lower watershed via Grove Creek. It does not address sedimentation problems arising in the lower watershed. Flood peaks in lower Grove Creek will be increased by 77 cubic feet per second. Overland flow to Silver Bow Creek through the north drainageway would be reduced from 125 cfs to 26 cfs. The alternative does not solve the continued degradation of ground and surface waters in the lower watershed.

It is assumed that base flow in lower Grove Creek will infiltrate the rock riprapped channel constructed through the mine tailings, resulting in the elimination of base flow in much of lower Grove Creek.

Alternative Three

The transport of sediments from the upper to the lower watershed is eliminated with this alternative. Channel erosion and resulting sediment within lower Grove Creek will be greatly reduced. Heavy metal contamination and sedimentation arising within the tailings area of the lower watershed will not be corrected. Contamination resulting from runoff over mine tailings and landfill will increase heavy metal concentrations in lower Grove Creek.

Anticipated Future Action Without Project

In discussion with project sponsors, the following anticipated events are likely to occur without project action. Upon the expected collapse of the existing wood culvert beneath the mine tailing and landfill, an emergency channel for Grove Creek would likely be constructed around the landfill. The capacity of the emergency channel would be about the same as the present wood culvert (35 cubic feet per second). The discharge of floodwaters from this channel would flow onto the mine tailings area, creating a channel to the railroad track. The resulting discharge below the railroad track would likely carry tailings sediments into Lower Grove Creek and receiving waters. These sediments are acidic and are known to contain heavy metals.

Alternative One

This alternative eliminates the transport of sediments from the upper watershed to the lower watershed via Grove Creek. It does not address sedimentation problems arising in the lower watershed. Flood peaks in Lower Grove Creek will be increased by 77 cubic feet per second. Overland flow to Silver Bow Creek through the racetrack and cemetery, hereafter referred to as the north drainageway, would be reduced from 125 cfs to 25 cfs. Erosion of mine tailings would be increased due to flood waters overtopping the riprapped channel and eroding the tailings banks. This alternative does not solve the continued degradation of ground and surface waters in the lower watershed.

It is assumed that base flow in Lower Grove Creek will infiltrate the rock riprapped channel constructed through the mine tailings, resulting in the elimination of base flow in much of Lower Grove Creek.

Alternative Two

This alternative eliminates the transport of sediments from the upper watershed to the lower watershed via Grove Creek. It does not address sedimentation problems arising in the lower watershed. Flood peaks in Lower Grove Creek will be increased by 77 cubic feet per second. Overland flow to Silver Bow Creek through the north drainageway would be reduced from 125 cfs to 25 cfs. The alternative does not solve the continued degradation of ground and surface waters in the lower watershed.

It is assumed that base flow in Lower Grove Creek will infiltrate the rock riprapped channel constructed through the mine tailings, resulting in the elimination of base flow in much of Lower Grove Creek.

Alternative Three

The transport of sediments from the upper to the lower watershed is eliminated with this alternative. Channel erosion and resulting sediment within Lower Grove Creek will be greatly reduced. Heavy metal contamination and sedimentation arising within the tailings area of the lower watershed will not be corrected. Contamination resulting from runoff over mine tailings and landfill will increase heavy metal concentrations in Lower Grove Creek.

Alternative Four

This alternative eliminates the transport of sediment from the upper to the lower watershed. Ground water infiltration of the landfill and mine tailings will be greatly reduced through construction of a saturation barrier, the Timber Butte Diversion, and a 42 inch conveyance pipe around the landfill and mine tailings.

As in alternatives one and two, 26 cfs will be diverted down the north drainageway during flood flow periods. Minor water pollution could occur during flood flow periods when waters pass through an industrial area.

Alternative Five

Sediment transport from the upper to the lower watershed will be eliminated. During flood flows, passage of water over the mine tailings via the riprapped channel will infiltrate the tailings, degrading ground water quality. The saturation barrier, the Timber Butte Diversion, and the 24-inch conveyance pipe will reduce ground and surface water degradation.

As in alternatives one, two and four, 26 cfs will be diverted from Grove Creek down the north drainageway during flood flow periods. Minor water pollution would likely occur during these periods when waters pass through an industrial area.

Alternative Six

The transport of sediment from the upper to the lower watershed via Grove Creek will be eliminated. The saturation barrier, the Timber Butte Diversion, the 24-inch conveyance pipe, and the almost complete diversion of flood flows (80 percent) to the north drainageway will greatly improve ground and surface water quality in lower Grove Creek.

Major flood induced impacts within the north drainageway would occur during flood flow periods with implementation of this alternative. Such impacts would likely include erosion, sedimentation, and industrial and urban contamination of surface waters.

Alternative Seven

Sediment transport from upper to lower Grove Creek will be eliminated. The saturation barrier, the Timber Butte Diversion, the 24-inch conveyance pipe, and the almost complete diversion of flood flows (80 percent) to the north drainageway will greatly improve ground and surface water quality in lower Grove Creek. Surface reclamation of mine tailings that includes shaping, topsoiling, and vegetation establishment will greatly reduce dust and further improve degraded ground and surface waters in the lower watershed.

Major flood induced impacts within the north drainageway would occur during flood flow periods with implementation of this alternative. Such impacts would likely include erosion, sedimentation, and industrial and urban contamination of surface waters.

Alternative Four

This alternative eliminates the transport of sediment from the upper to the lower watershed. Ground water infiltration of the landfill and mine tailings will be greatly reduced through construction of a saturation barrier, the Timber Butte Diversion, and a 42 inch conveyance pipe around the landfill and mine tailings.

As in alternatives one and two, 26 cfs will be diverted down the north drainageway during flood flow periods. Minor water pollution could occur during flood flow periods when waters pass through an industrial area.

Alternative Five

Sediment transport from the upper to the lower watershed will be eliminated. During flood flows, passage of water over the mine tailings via the riprapped channel will infiltrate the tailings, degrading ground water quality. The saturation barrier, the Timber Butte Diversion, and the 24-inch conveyance pipe will reduce ground and surface water degradation.

As in alternatives one, two and four, 26 cfs will be diverted from Grove Creek down the north drainageway during flood flow periods. Minor water pollution would likely occur during these periods when waters pass through an industrial area.

Alternative Six

The transport of sediment from the upper to the lower watershed via Grove Creek will be eliminated. The saturation barrier, the Timber Butte Diversion, the 24-inch conveyance pipe, and the almost complete diversion of flood flows (80 percent) to the north drainageway will greatly improve ground and surface water quality in lower Grove Creek.

Major flood induced impacts within the north drainageway would occur during flood flow periods with implementation of this alternative. Such impacts would likely include erosion, sedimentation, and industrial and urban contamination of surface waters.

Alternative Seven

Sediment transport from upper to lower Grove Creek will be eliminated. The saturation barrier, the Timber Butte Diversion, the 24-inch conveyance pipe, and the almost complete diversion of flood flows (80 percent) to the north drainageway will greatly improve ground and surface water quality in lower Grove Creek. Surface reclamation of mine tailings that includes shaping, topsoiling, and vegetation establishment will greatly reduce dust and further improve degraded ground and surface waters in the lower watershed.

Major flood induced impacts within the north drainageway would occur during flood flow periods with implementation of this alternative. Such impacts would likely include erosion, sedimentation, and industrial and urban contamination of surface waters.

Table 1
GROVE CREEK

PROBLEMS	1	2	3
1. Flooding 2. Sediment deposition 3. Water quality 4. Failure of tailings conduit	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland 2. Flood prevention a. Sediment trap in Grove Creek b. 35 cfs riprapped channel in tailings	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland 2. Flood Prevention a. Sediment trap in Grove Creek b. 132 cfs riprapped channel in tailings c. Channel restoration in lower Grove Creek d. Increase capacity for existing road crossings in lower Grove Creek	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland 2. Flood Prevention a. Sediment basin in Grove Creek b. Open channel 200 cfs diversion from sediment trap on Grove Creek toward Williamsburg (1 mi.) with pipe drop and outlet into Silver Bow Creek c. 24" closed conduit (2200') bypassing landfill & tailings in Grove Creek

Table 1
GROVE CREEK

PROBLEMS	I	II	III
1. Flooding	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland	1. Land Treatment a. Critical area land treatments in upper watershed b. Land management 1. pasture 2. rangeland
2. Sediment deposition	2. Flood prevention a. Sediment trap in Grove Creek b. 35 cfs riprapped channel in tailings	2. Flood prevention a. Sediment trap in Grove Creek b. 132 cfs riprapped channel in tailings c. Channel restoration in Lower Grove Creek d. Increase capacity for existing road crossings in Lower Grove Creek.	2. Flood Prevention a. Sediment basin in Grove Creek b. Open channel 200 cfs diversion from sediment trap on Grove Creek toward Williamsburg (1 mi.) with pipe drop and outlet into Stive Bow Creek c. 24" closed conduit (2200') bypassing land fill & tailings to Grove Creek
3. Water Quality			
4. Failure of tailings conduit			

Selected

ALTERNATIVES

4	5	6	7
1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland	1. Land Treatment a. Critical area land treatment in upper watershed b. Land management 1. pasture 2. rangeland
2. Water Quality and Flood Prevention a. Sediment trap in Grove Creek ~~b. Saturation barrier along landfill~~ c. 42" closed conduit (2200') bypassing landfill & tailings in Grove Creek d. Channel restoration in lower Grove Creek e. Increase capacity for existing road crossings in lower Grove Creek f. ~~New Timber Butte diversion (2000') to bypass tailings & landfill~~ g. Tailings runoff settling basin	2. Water Quality and Flood Prevention a. Sediment trap in Grove Creek b. Saturation barrier along landfill c. 24" closed conduit (2200') & 103 cfs rip-rapped channel bypassing landfill & in tailings d. Channel restoration in lower Grove Creek e. Increase capacity for existing road crossings in lower Grove Creek f. New Timber Butte diversion (2000') to bypass tailings & landfill g. Tailings runoff settling basin	2. Water Quality a. Sediment trap in Grove Creek b. Saturation barrier along landfill c. 24" closed conduit (2200') bypassing land-landfill & tailings d. New Timber Butte diversion (2000') to bypass tailings and landfill e. Tailings runoff settling basin	2. Water Quality a. Sediment trap in Grove Creek b. Saturation barrier along landfill c. Tailings shaping & vegetation establishment d. 24" closed conduit bypassing landfill & tailings e. New Timber Butte diversion (2000') to bypass tailings and landfill

ALTERNATIVES			
4	5	6	7
1. Land Treatment	1. Land Treatment	1. Land Treatment	1. Land Treatment
a. Critical area land treatment in upper watershed	a. Critical area land treatment in upper watershed	a. Critical area land treatment in upper watershed	a. Critical area land treatment in upper watershed
b. Land management	b. Land management	b. Land management	b. Land management
1. pasture	1. pasture	1. pasture	1. pasture
2. rangeland	2. rangeland	2. rangeland	2. rangeland
2. Water Quality and Flood Prevention	2. Water Quality and Flood Prevention	2. Water Quality	2. Water Quality
a. Sediment trap in Grove Creek	a. Sediment trap in Grove Creek	a. Sediment trap in Grove Creek	a. Sediment trap in Grove Creek
b. Saturation barrier along landfill	b. Saturation barrier along landfill	b. Saturation barrier along landfill	b. Saturation barrier along landfill
c. 24" closed conduit (2200') bypassing landfill & tailings in Grove Creek	c. 24" closed conduit (2200') & 103 cfs riprapped channel bypassing landfill & in tailings	c. 24" closed conduit (2200') bypassing landfill & tailings	c. Tailings shaping & vegetation establishment
d. Channel restoration in lower Grove Creek	d. Channel restoration in lower Grove Creek	d. New Timber Butte diversion (2000') to bypass tailings and landfill	d. 24" closed conduit bypassing landfill & tailings
e. Increase capacity for existing road crossings in lower Grove Creek	e. Increase capacity for existing road crossings in lower Grove Creek	e. Tailings runoff settling basin	e. New Timber Butte diversion (2000') to bypass tailings and landfill
f. New Timber Butte diversion (2000') to bypass tailings & landfill	f. New Timber Butte diversion (2000') to bypass tailings & landfill		
g. Tailings runoff settling basin	g. Tailings runoff settling basin		

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
A. Areas of Natural Beauty									
1. Visual quality & aesthetics									
a. Upper watershed	Good-rural setting	D	A	A	A	A	A	A	A
b. Lower watershed	Poor-urban/industrial	A	A	A	A	A	A	A	B
B. Quality Consideration of Air, Land and Water									
1. Air - Period of Project									
a. Period of Installation (short term), Smoke & exhaust fumes, dust, other pollutants, noise	Good quality	D	D	D	D	D	D	D	D
b. Project Duration (long term), Dust	Fair quality	A	A	A	A	A	A	A	C
2. Land									
a. Soil erosion	Fair to poor quality	D	A	A	A	A	A	A	B
b. Wildlife land	Not significant	-	-	-	-	-	-	-	-
c. Recreation land	Not significant	-	-	-	-	-	-	-	-
d. Natural plant communities									
1) Upper watershed	Fair condition	D	A	A	A	A	A	A	A
2) Lower watershed	Poor condition	D	A	A	A	A	A	A	A
e. Riparian environments	Not significant	A	A	A	A	A	A	A	D
3. Water - Grove Creek Man-altered intermittent stream									
a. Sedimentation									
1) Upper watershed	High sediment load	D	A	A	A	A	A	A	A
2) Lower watershed	High sediment load	E	B	B	B	C	C	B	C

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
A. Areas of Natural Beauty								
1. Visual quality & aesthetics								
a. Upper watershed — Good-rural setting	D	A	A	A	A	A	A	A
b. Lower watershed — Poor-urban/industrial	A	A	A	A	A	A	A	B
B. Quality Consideration of Air, Land and Water								
1. Air - Period of Project								
a. Period of Installation (short term), Smoke & exhaust fumes, dust, other pollutants, noise — Good quality	D	D	D	D	D	D	D	D
b. Project Duration (long term), Dust — Fair quality	A	A	A	A	A	A	A	C
2. Land								
a. Soil erosion — Fair to poor quality	D	A	A	A	A	A	A	B
b. Wildlife land — Not significant	-	-	-	-	-	-	-	-
c. Recreation land — Not significant	-	-	-	-	-	-	-	-
d. Natural plant communities								
1) Upper watershed — Fair condition	D	A	A	A	A	A	A	A
2) Lower watershed — Poor condition	D	A	A	A	A	A	A	A
e. Riparian environments — Not significant	A	A	A	A	A	A	A	D
3. Water - Grove Creek								
Man-altered intermittent stream								
a. Sedimentation								
1) Upper watershed — High sediment load	D	A	A	A	A	A	A	A
2) Lower watershed — High sediment load	E	B	B	B	C	C	B	C

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
b. Streamflow regime									
1) Upper watershed	Base flow 0-2 cfs	A	A	A	A	A	A	A	A
2) Lower watershed	Base flow 0-2 cfs	D	A	A	E	B	B	E	E
4. Water - receiving waters Silver Bow/Blacktail Deer Creek									
a. Sedimentation	Moderate sedimentation	D	A	A	B	B	B	B	B
b. Streamflow regime	Perennial stream	A	A	A	A	A	A	A	A
5. Water Quality - Grove Creek									
a. Upper watershed - base flow									
1) Discharge	0-2 cfs	A	A	A	A	A	A	A	A
2) Organics - suspended solids	Low concentration	A	A	A	A	A	A	A	A
3) Toxic metals	Low concentration	A	A	A	A	A	A	A	A
b. Upper watershed - flood flow									
1) Discharge	200+ cfs	A	A	A	A	A	A	A	A
2) Organics - suspended solids	Moderate to high concentration	A	A	A	A	A	A	A	A
3) Toxic metals	Low concentration	A	A	A	A	A	A	A	A
c. Lower watershed - base flow									
1) Discharge	0-2 cfs	D	A	A	B	B	B	B	B
2) Organics - suspended solids	Moderate concentration	-	-	-	-	-	-	-	-
3) pH	Satisfactory range	-	-	-	-	-	-	-	-
4) Specific conductivity	Low concentration	-	-	-	-	-	-	-	-
5) Toxic metals	High concentration	-	-	-	-	-	-	-	-

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
b. Streamflow regime									
1) Upper watershed	Base flow 0-2 cfs	A	A	A	A	A	A	A	A
2) Lower watershed	Base flow 0-2 cfs	D	A	A	E	B	B	E	E
4. Water - receiving waters									
Silver Bow/Blacktail Deer Creek									
a. Sedimentation	Moderate sedimentation	D	A	A	B	B	B	B	B
b. Streamflow regime	Perennial stream	A	A	A	A	A	A	A	A
5. Water Quality - Grove Creek									
a. Upper watershed - base flow									
1) Discharge	0-2 cfs	A	A	A	A	A	A	A	A
2) Organics - suspended solids	Low concentration	A	A	A	A	A	A	A	A
3) Toxic metals	Low concentration	A	A	A	A	A	A	A	A
b. Upper watershed - flood flow									
1) Discharge	200+ cfs	A	A	A	A	A	A	A	A
2) Organics - suspended solids	Moderate to high concentration	A	A	A	A	A	A	A	A
3) Toxic metals	Low concentration	A	A	A	A	A	A	A	A
c. Lower watershed - base flow									
1) Discharge	0-2 cfs	D	A	A	B	B	B	B	B
2) Organics - suspended solids	Moderate concentration	-	-	-	-	-	-	-	-
3) pH	Satisfactory range	-	-	-	-	-	-	-	-
4) Specific conductivity	Low concentration	-	-	-	-	-	-	-	-
5) Toxic metals	High concentration	-	-	-	-	-	-	-	-

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
d. Lower watershed - flood flow									
1) Discharge	55+ cfs	E	B	B	C	B	B	C	C
2) Organics - suspended solids	High concentration	E	B	B	E	C	B	C	C
3) pH	Moderate concentration	E	B	B	E	C	C	C	C
4) Specific conductivity	Moderate concentration	E	B	B	E	C	B	B	B
5) Toxic metals	High concentration	E	B	B	E	C	C	C	C
5. Blacktail Deer Creek (below Grove Creek)									
a. Base flow									
1) Discharge	3-15 cfs	D	A	A	B	B	B	B	B
2) Organics - suspended solids	10 mg/l TSS	D	A	A	A	A	A	A	A
3) Toxic Metals	Moderate to high concentration	E	A	A	E	B	B	B	B
b. Flood flow									
1) Discharge	28 cfs	E	B	B	B	B	B	C	C
2) Organics - suspended solids	300 mg/l TSS	E	B	B	E	C	B	C	C
3) Toxic metals	High concentration	E	B	B	E	C	C	C	C
6. Silver Bow Creek (Blacktail Deer Creek to Metro sewer)									
a. Baseflow									
1) Discharge	8-25 cfs	D	A	A	B	B	B	B	B
2) Organics - suspended solids	Moderate concentration	D	A	A	A	A	A	A	A
3) Toxic metals	Moderate to high concentration	E	A	A	B	B	B	B	B

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1	2	3	4	5	6	7
d. Lower watershed - flood flow									
1) Discharge	55+ cfs	E	B	B	C	B	B	C	C
2) Organics - suspended solids	High concentration	E	B	B	E	C	B	C	C
3) pH	Moderate concentration	E	B	B	E	C	C	C	C
4) Specific conductivity	Moderate concentration	E	B	B	E	C	B	B	B
5) Toxic metals	High concentration	E	B	B	E	C	C	C	C
5. Blacktail Deer Creek (below Grove Creek)									
a. Base flow									
1) Discharge	3-15 cfs	D	A	A	B	B	B	B	B
2) Organics - suspended solids	10 mg/l TSS	D	A	A	A	A	A	A	A
3) Toxic Metals	Moderate to high concentration	E	A	A	E	B	B	B	B
b. Flood flow									
1) Discharge	28 cfs	E	B	E	B	B	B	C	C
2) Organics - suspended solids	200 mg/l TSS	E	E	B	E	C	B	C	C
3) Toxic metals	High concentration	E	B	D	E	C	C	C	C
6. Silver Bow Creek (Blacktail Deer Creek to Metro sewer)									
a. BaseFlow									
1) Discharge	8-25 cfs	D	A	A	B	B	B	B	B
2) Organics - suspended solids	Moderate concentration	D	A	A	A	A	A	A	A
3) Toxic metals	Moderate to high concentration	E	A	A	B	B	B	B	B

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
b. Flood flow									
1) Discharge	38 cfs	E	B	B	C	B	B	C	C
2) Organics - suspended solids	High concentration	E	B	B	E	C	B	C	C
3) Toxic metals	High concentration	E	B	B	E	C	C	C	C
7. Shallow Groundwater									
a. Landfill area									
1) Recharge	High (during floodstage)	A	D	D	D	C	C	C	C
2) Organics & nutrients	Moderate concentrations	A	D	D	D	C	C	C	C
3) Specific conductivity	Very High (up to 4000 umos)	A	D	D	D	C	C	C	C
4) Toxic metals	Very High concentration	A	D	D	D	C	C	C	C
b. Tailings area									
1) Recharge	Low to moderate	E	A	A	B	C	B	C	C
2) Specific conductivity	High (up to 1700 umos)	E	A	A	B	C	B	C	C
3) Toxic metals	High concentration	E	A	A	B	C	B	C	C
C. Biological Resources and Selected Ecological Systems									
1. Threatened or endangered plants and animals	None	-	-	-		-	-	-	-
2. Wildlife habitats									
a. Wetlands	18 ac Type 3	D	A	A	B	B	B	B	B
b. Uplands	Not significant	A	A	A	A	A	A	A	A

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
b. Flood flow									
1) Discharge	38 cfs	E	B	B	C	B	B	C	C
2) Organics - suspended solids	High concentration	E	B	B	E	C	B	C	C
3) Toxic metals	High concentration	E	B	B	E	C	C	C	C
7. Shallow Groundwater									
a. Landfill area									
1) Recharge	High (during floodstage)	A	D	D	D	C	C	C	C
2) Organics & nutrients	Moderate concentrations	A	D	D	D	C	C	C	C
3) Specific conductivity	Very High (up to 4000 umos)	A	D	D	D	C	C	C	C
4) Toxic metals	Very High concentration	A	D	D	D	C	C	C	C
b. Tailings area									
1) Recharge	Low to moderate	E	A	A	B	C	B	C	E
2) Specific conductivity	High (up to 1700 umos)	E	A	A	B	C	B	C	C
3) Toxic metals	High concentration	E	A	A	B	C	B	C	C
C. Biological Resources and Selected Ecological Systems									
1. Threatened or endangered plants and animals	None	-	-	-	-	-	-	-	-
2. Wildlife habitats									
a. Wetlands	18 ac Type 3	D	A	A	B	B	B	B	B
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Preliminary Environmental Evaluation

	Present Status	Effects 1/ Future w/o Project	Alternatives & Anticipated Impacts 1/ 1	2	3	4	5	6	7
3. Aquatic ecosystems									
a. Grove Creek	None	-	-	-	-	-	-	-	-
b. Blacktail Deer Creek (below Grove Creek)	Poorly developed	A	A	A	A	A	A	A	A
c. Silver Bow Creek	Poorly developed	A	A	A	A	A	A	A	A
4. Coldwater Fish Populations									
a. Grove Creek	None	-	-	-	-	-	-	-	-
b. Blacktail Deer Creek (below Grove Creek)	Poor trout population	A	A	A	B	B	B	B	B
c. Silver Bow Creek	None to Poor trout population	A	A	A	A	A	A	A	A
D. Historical, Archeological and Geological Resources									
1. Historical	Minor significance	A	A	A	A	A	A	A	A
2. Archeological	Not significant	A	A	A	A	A	A	A	A
3. Geological	Not significant	A	A	A	A	A	A	A	A

1/ Future Conditions
A = Essentially no change from present condition
B = Small increase over present condition
C = Moderate to large increase over present condition
D = Small decrease over present condition
E = Moderate to large decrease over present condition

Anticipated impacts when compared to effects of the future without project, based on changes in quality of the environment.

Table 2
GROVE CREEK WATERSHED

Preliminary Environmental Evaluation

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SOLID WASTE SECTION

Monitoring System Designs for Nine Selected Sanitary Landfill Sites in Montana

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General Statement

Introduction

Buried refuse in a sanitary landfill is subject to leaching by percolating water derived from rain or snowmelt (Freeze and Cherry, 1979, p. 435) . The leachate produced from water moving through refuse contains high concentrations of inorganic contaminants (Griffin et al., 1976) and organic contaminants (Robertson et al., 1974). Garland and Mosher (1975) have cited several examples where groundwater pollution has been caused by landfills (Freeze and Cherry, 1979, p. 436).

The Montana Solid Waste Management Bureau has identified nine sites where contamination of surface or groundwater by landfill leachate is possible. Monitoring systems are needed for these sites. The purpose of the monitoring systems is to determine if contamination of ground or surface water is taking place. This report presents monitoring designs to achieve this purpose.

Groundwater

The existence of groundwater contamination from the sites will be evaluated with water samples from a group of observation wells. The wells should intersect the groundwater flow system above, in, and below each landfill site. If groundwater contamination is demonstrated, additional wells may be necessary to trace the movement of the leachate plume.

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The existence of groundwater contamination from the sites will be evaluated with water samples from a group of observation wells. The wells should intersect the groundwater flow system above, in, and below each landfill site. If groundwater contamination is demonstrated, additional wells may be necessary to trace the movement of the leachate plume.

During drilling, the wells should be carefully logged for lithology and the presence of water bearing zones by a competent hydrogeologist. The wells should be drilled 20 feet past the water table to accomodate fluctations in the water table. The pipes for the wells should be 4 inches in diameter so the wells can handle sampling and monitoring equipment. The holes should be cased with PVC rather than steel to avoid tainting the water samples with metals. The wells should be slotted or perforated to encompass the full range of water level fluctuations, surged, and packed with pea gravel to within 3 feet of the surface. The upper 3 feet of the hole should be packed with clay. The clay should be mounted around the casing to prevent surface water access. The casing should stand at least 2 feet above the ground surface and should be capped with a removable PVC cap to keep the well clean.

Surface Water

Where possible, surface water samples should be collected both upstream and downstream of the landfill site.

Sampling

Water samples should be collected at places and times when detection of contamination is most likely. Depth integrated sampling of streams is recommended. Although water-well pumping before sampling is desireable, this technique may produce some problems for low capacity wells. Excessive pumping could lead to measurement of water following flow lines that are not directly connected to the land-fill site. For this reason two samples are recommended:

During drilling, the wells should be carefully logged for stratigraphy and the presence of water bearing zones by a geoscience hydrogeologist. The well should be drilled 20 feet past the water table to accommodate fluctuations in the water table. The piers for the wells should be 4 feet in diameter so the wells can handle sampling or monitoring equipment. The holes should be cased with [illegible] to avoid tainting the water samples with metals. The wells should be slotted or perforated to encompass the full range of water level fluctuations, surged, and packed with sea gravel to within 3 feet of the surface. The upper 3 feet of the hole should be packed with clay. The clay should be mounted around the casing to prevent surface water access. The casing should stand at least 2 feet above the ground surface and should be capped with a removable PVC cap to keep the well clean.

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Water samples should be collected at places and times when detection of contamination is most likely. Depth integrated sampling of streams is recommended. Although water-well pumping before sampling is desireable, this technique may produce some problems for low capacity wells. Exhaustive pumping could lead to measurement of water following flow lines that are not directly connected to the landfill site. For this reason two samples are recommended.

1. Run a specific electrical conductance profile at suitable intervals down the well. Then sample the highest conductance/temperature water more than one foot below the top of the water column. The top of the well has the highest possibility of contamination from material falling into the well.

2. Pump the well long enough to remove a volume of water equal to the volume of the casing. If possible the well should be pumped 30 minutes and then sampled, but this procedure may not always be possible if the well has a low specific capacity. Assessment of which technique should be used should be made on-site by the sampler and justified in the field notes. After the pumping, a depth integrated sample should be taken.

Sample handling is important, and should follow techniques recommended by the U.S. Environmental Protection Agency (1974); and Brown, Skougstad, and Fishman (1970).

Samples should be collected on or near four dates, at least during the first year of the sampling program: April 15, May 15, July 1, and October 1. Modification of this time framework may be necessary when more is learned concerning the timing of leachate production and movement at individual sites.

Little is known concerning the composition of leachate in a semi-arid environment. From work done in other areas, however, it seems that water quality analyses should include inorganic contaminants (Griffin et al., 1976), organic contaminants (Freeze and Cherry, 1979, p. 424-426; Robertson et al., 1974), and trace metals (Freeze and Cherry, 1979, p. 416-420; Dunne and Leopold, 1978, p. 735-739).

4. Dig a quantitative chemical analysis profile at suitable intervals down the well. Then begin the shovel convergence/divergence method from four feet below the top of the water column. The top of the well has the highest probability of contamination from materials falling into the well.

5. Keep the well large enough to remove a volume of water equal to the volume of the casing. If possible, the well should be pumped 30 minutes and then sampled. But this procedure may not always be possible if the well has a low productivity. Assessment of which conditions should be used should be made only by the sampler and indicated in the field notes. Keep the pump line, a sample line, and other equipment clean.

Sampling material in Jacksonville, and sampling in Los Angeles recommended by the U.S. Geological Survey (Fred Lincoln Curtis and Bruce Cunningham, unpublished data 1979).

Samples should be collected during your first visit, at least during the first year of the monitoring program. Until 15, May 15, July 1, and October 1. Analysis of this time frame may be necessary when such a method concerning the timing of leaching production and accuracy is indicated.

Nitrate is known concerning the contamination of groundwater in a semi-arid environment. Free work done in other areas, however, is some that water quality analyses should include inorganic contaminants (Ziegler et al., 1979), organic contaminants (Green and Cherry, 1978, p. 434-436; Anderson et al., 1979), and trace metals (Green and Cherry, 1978, p. 436-438; Lenoe and Lagoda, 1978, p. 316-320).

Site: Butte Sanitary Landfill

Location: SE 1/4, Sec. 26, T3N, R8W

Reason For Monitoring: The Butte sanitary landfill is located in highly permeable alluvial materials and mine tailings. A high potential exists for contamination of surface and groundwater by leachate from the landfill. Due to this high potential for contamination, the Solid Waste Management Bureau has selected the Butte landfill for the design of a monitoring system.

Sample Site Selection: The rationale for the selection of sample sites is discussed under the General Statement.

Eight observation wells are advised to monitor groundwater at the Butte sanitary landfill site (see figure 3). Those wells designated as primary sampling sites are the absolute minimum needed for monitoring to be undertaken. If only these wells are included in the monitoring system however, monitoring will not be complete. Those wells designated as secondary sampling sites are highly recommended. The most complete monitoring system would include those wells designated as primary, secondary, and tertiary sampling sites.

Five surface water sampling sites are recommended (see figure 3). The three southwestern sampling sites will monitor water quality upstream of the landfill site. The central sampling site adjacent to the landfill should monitor contamination from just the landfill site, and the northeastern sampling site should monitor contamination contributed by both the landfill and the mine tailings.

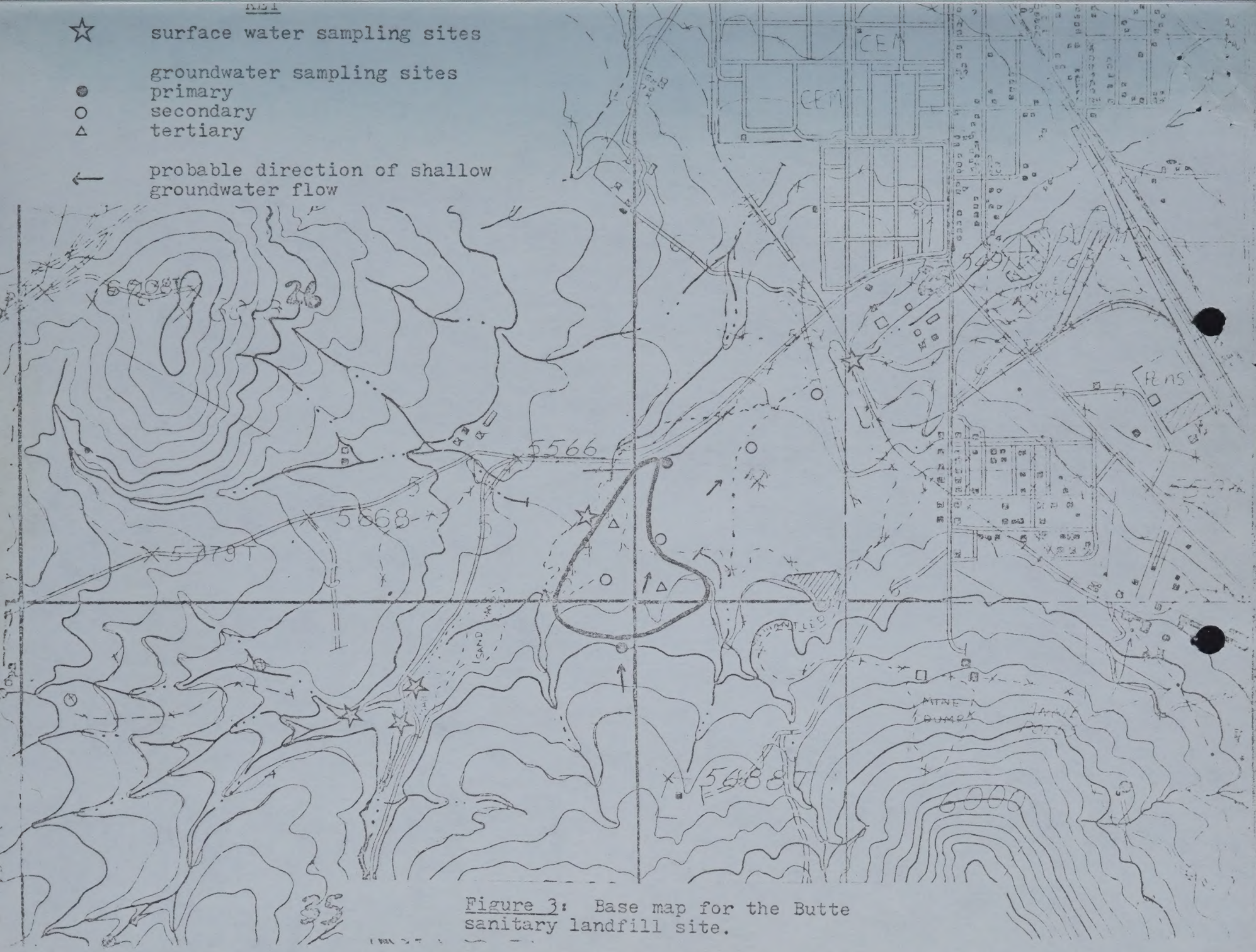

Figure 3: Base map for the Butte sanitary landfill site.